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THE COAL AND IRON RECORD.

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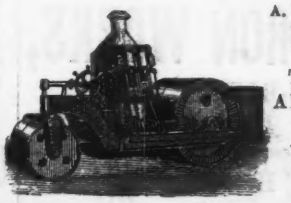

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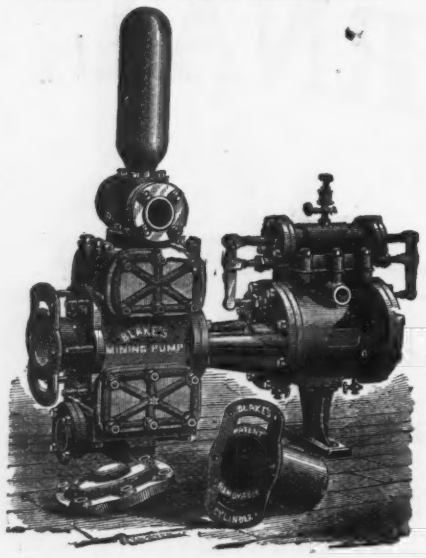

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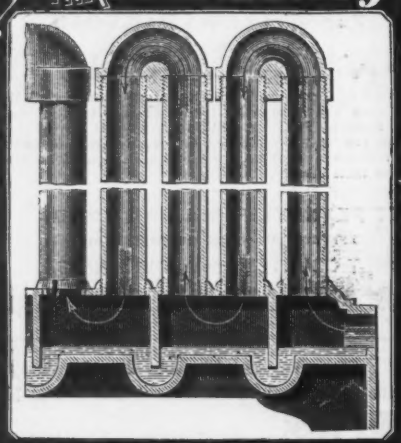

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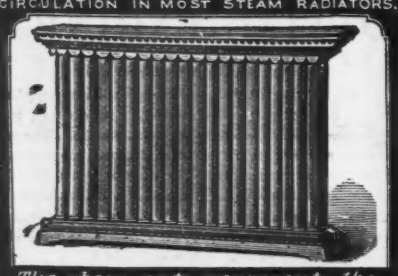

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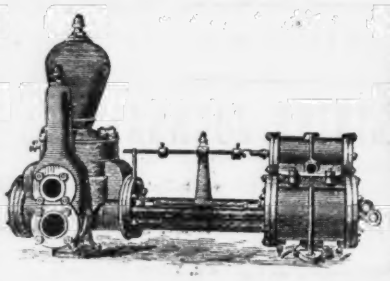

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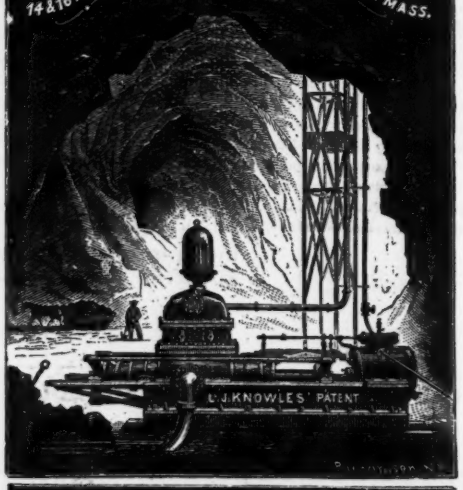

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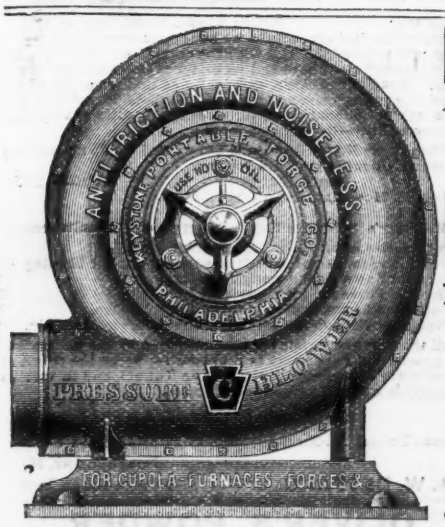

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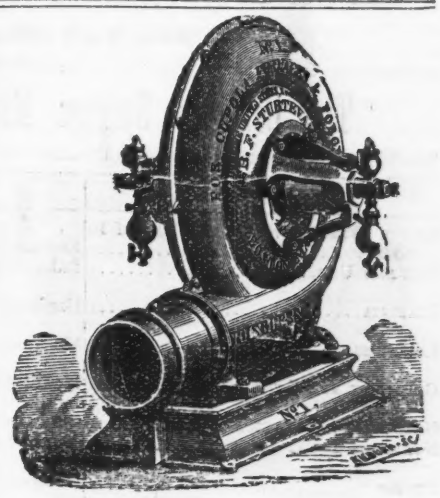

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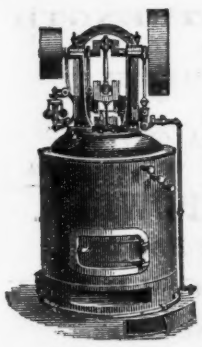

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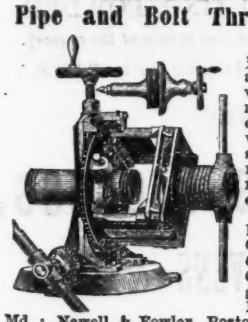

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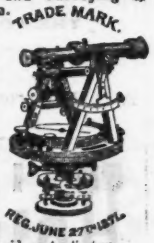

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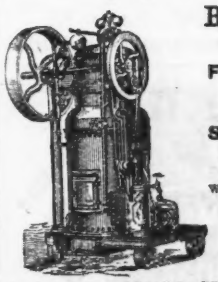

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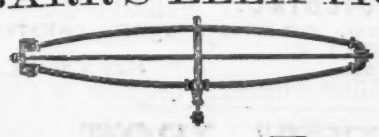

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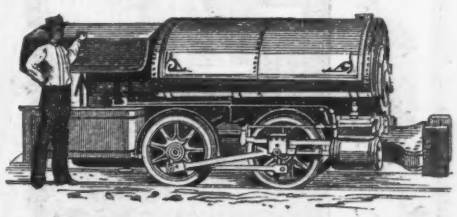

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THE ENGINEERING AND MINING JOURNAL.

RICHARD P. ROTHWELL, C. E., M. E.
ROSSITER W. RAYMOND Ph. D. } Editors.

NOTE.—Communications relative to the editorial management should be addressed to Mr. ROTHWELL. The articles written by Mr. Raymond will be signed with a star.

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Phosphorus Steel.—The du Motay Patents.

IN May, 1874, letters-patent of the United States were granted for the manufacture of Phosphorus Steel, to EDWARD STERN, of New York, as assignee of the entire right of C. M. T. DU MOTAY, the inventor, who resides in Paris, France. This new manufacture, which substitutes phosphorus for carbon, as the agent for steelifying iron, will enable steel-makers to substitute the cheap and abundant phosphoric irons of the country for the comparatively rare and costly non-phosphoric irons, which, heretofore, have been deemed the only material from which good steel could be made.

Like all patented inventions which advance any important art, a step forward, Mr. STERNS' right to his patent, for this invention, has been contested by other claimants, which is somewhat remarkable, considering the vigorous investigation into the history of the art, by the scientific corps of the Patent Office, which, it is well known, is always made before a patent is granted. But interferences were declared between those who filed the conflicting claims and Mr. DU MOTAY, and in every case priority of invention has been awarded to him. The last of these cases was decided on the 8th day of the present month.

This important patent having thus successfully run the gauntlet of conflicting claimants, its trial, or probationary period, may fairly be considered to have terminated; and it may now be regarded as having entered upon the term of established and conceded validity, which all patents for really new and important inventions attain, sooner or later, and those who have taken licenses under it, may rest with confidence upon their title, and safely proceed to construct their plant, which, fortunately, is inexpensive, as compared with that for making the Bessemer or crucible steels, and, therefore, is adapted for use by the small ironworks, with limited capital, as well as by larger and wealthier establishments.

The Retail Price of Bituminous Coal in New York.

It has long been a matter of surprise that our excellent domestic bituminous coals have so limited a sale in this city, and that they have not driven foreign coals from this market. The reason is not hard to find, and the remedy is in the hands of the "miners and shippers" of the coal. According to our regular market reports the retail and wholesale prices of bituminous coals are as follows:—

	RETAIL, per 2,000 lb.	WHOLESALE, per 2,240 lb.
Liverpool House Orrel, delivered	$23 00	$13 00
Liverpool House Cannel "	25 00	20 00
American " "	15 00	11 00
Kanawha Splint "	15 00	6 50
American Orrel "	11 00	6 50
Red Bank Cannel "	14 00	8 50
Cumberland "	7 00	5 50

We note for example that Kanawha splint, one of the best and most satisfactory grate coals that could be desired, sells here, wholesale, by the cargo, at $6 50 per ton of 2,240 lb. while it retails at $15 00 per ton of 2,000 lb., a difference of $9 20 or 159 per cent., by way of commission, for "handling" the coal. This outrageous charge has for effect to make our bituminous coals an article of luxury, and to greatly hinder the development of the trade.

A few dealers have the entire retail trade in bituminous coals in their hands, and instead of seeking to extend the use of American coal, by selling it at a fair price, say $7 to $8 a ton, at which price it would drive foreign coal from this market, they seem to be anxious to keep the price of American coal at such a figure as will enable them to keep an exceedingly lucrative, though small, business in foreign coal.

Let some of our West Virginia mining companies, the Cannelton, or Coalburg, for example, or the Red Bank, (Pennsylvania) Company, establish retail yards here, and sell their coal at reasonable prices, and the consumption of American coals will increase enormously, and it will render the importation of foreign coal impossible.

The Stewart Reduction Works.

THE *Evening Post* of December, 22 contains a paragraph announcing the destruction, by fire, on December 19, of the Stewart Reduction Works of Georgetown, Colorado.

These works were principally owned by Mr. J. L. BROWNELL, of this city, and as they were only lightly insured, and the conflagration, according to the above paragraph, appears to have left almost nothing of the extensive plant uninjured, the loss is necessarily a large one. The works are reported to have contained, at the time, over $100,000 dollars in ore and bullion; but this will not be a complete loss, as most of it can be regained after clearing off the *débris*.

The Stewart Reduction Works have, for many years, been the principal reliance of the Georgetown mines, for the marketing of the second-class ores of the region, which contain from $60 to $150 in silver per ton, and would certainly, in any other mining district, have been called "high grade." But these ores are all difficult to treat, inasmuch as they contain the silver ores mixed with a very high and troublesome percentage of zinc blende. Mr. STEWART had, through many years of practice, acquired skill in the treatment of ores of this class; and if he had not spent many large sums in the erection and testing of various new inventions, he would have realized a fortune for himself and his associates from the business which he controlled for so many seasons, almost as a monopoly, and on terms far more favorable to the metallurgical works than has usually been the case among the sharp and crowding competitions of ore-buyers in our Western silver districts. It is hard to say just how far a practical man at the head of works should go in the direction of experiment. Between the two extremes of stolid adherence to tradition, and wild adoption of *every* novelty, there is, doubtless, a proper mean. And, in general, it may be said that no metallurgical invention should be subjected to the expensive tests of practice on the commercial scale, until such light as the recorded experience of other experimenters, (which we call science), and the laboratory tests of the chemist can give it, has been fully thrown upon it. We have not always shared Mr. STEWART'S expectations concerning improvements which he had adopted, nor concerning others which he had too obstinately rejected. The AIREY furnace was a mistake from the beginning; and its subsequent alteration only made a bad STETEFELDT furnace out of it. On the other hand, the obstinate rejection of the Brückner cylinder, which is, and has long been, well known as a successful apparatus for chloridizing roasting, cost Mr. STEWART dear; and his determination to beat that apparatus, rather than adopt it, has, probably, led him into several ill-advised schemes. The last of these was the HUNT and DOUGLAS copper process, against which, from the chemical standpoint, nothing, but from the economical standpoint, in its application to Colorado argentiferous ores, a good deal can be said.

The remark of the *Evening Post*, that STEWART'S works were "the finest in the Rocky Mountains," is far from accurate. They were not even the best-appointed in Colorado. Nevertheless, they will be sorely missed. Scarcely any other works, except those of the Boston and Colorado Co. (Prof. HILL'S) at Black Hawk, could be so ill spared. For Mr. STEWART personally, as one of the most enterprising, public-spirited and useful citizens of the Territory, we have, in common with all who know him, the deepest sympathy.

NEW PUBLICATIONS.

A MANUAL OF METALLURGY, BY WM. H. GREENWOOD, F. C. S., VOL. II. NEW YORK. G. F. PUTNAM'S SONS.

IN this volume, the author treats of the metallurgy of copper, lead, zinc, mercury, silver, gold, nickel, cobalt and aluminium, and to our mind he has succeeded admirably in giving, in the short space of only 356 pages small octavo, "an *accurate, useful*, and as *comprehensive* an account, as space would permit, of the typical and more generally employed methods, pursued in the extraction of the useful metals from their ores; and to offer such explanations as are generally received of the scientific principles, upon which the several operations are based, and metallurgical operations depend."

From this introductory remark of the author, it is clear, that, while the work aims to give a sufficiency of information in regard to the metallurgy of the metals above mentioned, to the non-professional reader, it is not intended to supply the wants of the metallurgist. It may be called a popular metallurgy, which elucidates fully the science, while the many details connected with the various processes at different works, are omitted.

The work is very well up to the recent improvements in most of the metallurgical process, but two very important ones, viz: the HUNT & DOUGLASS process for the beneficiation of low-grade copper ores by the humid way, and the American method of treating by distillation the zinc-crusts obtained in the desilverization of lead, we miss. The latter process, although differing very little in principle from the original one introdued by PARKES, is vastly superior to it by its details, and ought to be better known than it appears to be.

In the matter of amalgamating gold and silver ores, the author's information does not seem to have been very profuse. This is perhaps excusable, when we consider how little has been published, authoritatively in regard to these processes in this country, where they are at home.

The cuts inserted in the text, are in every way sufficient for the purposes of the book.

The chemical quotations, nomenclature, and atomic weights employed, are those of the new system.

A GRAPHIC METHOD FOR SOLVING CERTAIN ALGEBRAIC PROBLEMS. By GEORGE L. VOSE, *Professor of Civil Engineering in Bowdoin College*, etc. New York, D. VAN NOSTRAND. 1875.

THIS interesting little book is, like many others of VAN NOSTRAND'S *Science Series*, an enlargement of contributions to the *Engineering Magazine*. It will

prove very suggestive to those *virtuosi* in mathematics who like to "wrestle" with puzzles, while, on the other hand, it will hint to the practical draughtsman and engineer a method by which much laborious calculation may be avoided. The graphic solution of simple problems has always been, to our mind at least, more cumbrous than the algebraic; but these elements may be present, which would greatly complicate the algebraic solution and which scarcely add to the labor of the graphic. Moreover, in many cases the geometric solution furnishes at a single operation not only the relations of two elements, but the value of each for every assumed value of the other. For example (to take instances furnished by Mr. VOSE's book), if we desire to know how far a man will travel in four hours at three miles per hour, the simplest possible operation is that of direct multiplication. But if we are obliged, by the conditions of some inquiry in which we are engaged, to know the positions of the traveler at numerous points ot time, measured, perhaps, in odd minutes and seconds as well as hours, the construction of a diagram, once for all, may save many multiplications. And simple multiplication would be quite inadequate to deal with such questions as the following: A person walked a certain distance from A to B at the rate of three and a half miles an hour, and then ran a part of the way back from B to A at the rate of seven miles an hour, walking the remaining distance (at the former rate) in five minutes, and being out twenty-five minutes in all. A second person walks from B to A and back again at a uniform rate, being also out twenty-five minutes in all. At what two times and at what distance from A will the two persons meet?

The algebraic solution of this problem is not difficult, but tedious. We must first ascertain from the movements of the first person the distance from A to B. If this distance is represented in miles by x, then the time occupied in walking from A to B is $\frac{2x}{7}$ in hours; the time occupied in returning is given as $\frac{1}{12}$ of an hour, and the rate of walking is $3\frac{1}{2}$ miles per hour; hence the distance run is $x-\frac{7}{24}$ miles, and the time occupied in running, at 7 miles per hour, must be $x-\frac{7}{24}$ divided by 7, or $\frac{24x-7}{168}$ hours. Now by the conditions given, the aggregate of these times is 25 minutes, or 5-12 of an hour. Hence we get at last the equation,

$$\frac{2x}{7}+\frac{24x-7}{168}+\frac{1}{12}=\frac{5}{12} \quad \text{whence } x=\frac{7}{8} \text{ of a mile.}$$

From this we may obtain the times occupied in wallking and running, viz.: 15 minutes and 5 minutes respectively.

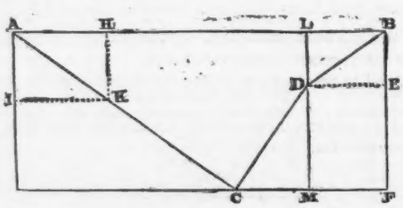
We must now consider the case of the second man, who walks from A to B and back at a uniform rate, in 25 minutes. Having ascertained the distance, it is very easy to calculate this rate. It must be $\frac{14}{8}\times\frac{60}{25}=4$ 1-5 miles per hour. Not until all this has been accomplished are we ready to proceed algebraically with the solution of the question as to the meeting of the two men. Their first meeting takes place at a point, say, x miles from A. The first man, walking from A, has consumed $\frac{2x}{7}$ hours in reaching that point; the second man, walking from B, has travelled 7-8 x miles, and has consumed a period of time represented by this distance, divided by his rate (4 1-5 miles per hour) or $\frac{35-40x}{168}$ hours. Since they start at the same moment, and travel till they meet, we have

$$\frac{2x}{7}=\frac{35-40x}{168} \quad \text{whence } x=\frac{35}{88} \text{ of a mile.}$$

The time is deduced from either of the above expressions, and is $\frac{10}{88}$ of an hour, or 6 9-11 minutes.

To determine time and place for the second meeting, the following is as simple as any algebraic method. Let x be the distance from A. The time which has elapsed since both first started has been differently employed by each. The first has walked 15 minutes from A to B, and has run, at 7 miles per hour, $\frac{7}{8}-x$ miles back towards A. The second has spent $12\frac{1}{2}$ minutes in going from B to A, and has walked x miles back towards B, at 4 1-5 miles per hour. Hence the first has been running $\frac{7}{8}-x$ divided by 7, or $\frac{7-8x}{56}$ hours from B, and the second has been walking $\frac{5x}{21}$ hours towards B. Their aggregate times are equal; hence, $\frac{1}{4}+\frac{7-8x}{56}=\frac{25}{120}+\frac{5x}{21}$, whence $x=\frac{7}{16}$ of a mile. The time, obtained from either side of the equation, is 5-16 of an hour, or $18\frac{3}{4}$ minutes.

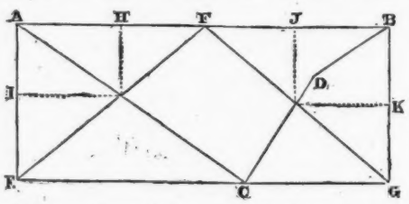
Now the graphic solution of this question is incomparably simpler than the foregoing:



Of course, for the convenience of the draughtsman, the paper should be ruled in squares, though in default of these, distances may be read with a scale.

Draw a line A B, of such a length as conveniently to represent twenty-five minutes, and at A a perpendicular to this line, to represent distances. By the conditions, the first traveler starts at the rate of three and a half miles per hour. Lay off AH, equal to a convenient fraction of an hour, say 1-7, and assume AI as the corresponding fraction of $3\frac{1}{2}$ miles, or half a mile. Draw through H and I parallels to AB and AI, and draw AK through their intersection. This line represents the rate of walking; that is, the ordinates of any point in it will represent the time and the distance from the initial point, as AI represents the distance, $\frac{1}{2}$ mile, corresponding to AH, 1-7 hour. Now, commencing at B, lay off a distance towards A, equal to 5 minutes; and upon a perpendicular at B, lay off the distance ($\frac{7}{24}$ of a mile) which the traveler walks in 5 minutes; ordinates from these points intersecting at D, give the time and distance at which the traveler begins his final five minutes' walk. Or, more quickly still, lay off BL=5 minutes, and draw BD at the same inclination as AK—that is, LBD=HAK. Finally draw a diagonal from D at the angle corresponding to 7 miles per hour; that is, lay off from L towards A a distance equal to AH, and from E towards F a distance equal to twice AI. The ordinates drawn from the two points thus found will give by their intersection a point on the desired diagonal, which may be connected with D. The intersection of this diagonal with the produced line AK gives the point C, through which a parallel may be drawn to AB, completing the diagram of the first traveler's course. The line BF will give the length in miles between the two points. The traveler goes at the rate of $3\frac{1}{2}$ miles per hour for a time and distance shown by the ordinates of C, the distance being=BF, and the time being measured by the line from C to the lower left-hand corner of the diagram.

The second traveler maintains for the same aggregate period a uniform rate, going and returning. Hence his course may be added to the same diagram, as



is shown herewith, in our second figure. In this figure AB is 25 minutes, as before; AE=BG is the distance between the terminis (traversed going and coming by each man) and ACDB is the broken line, constructed according to the conditions, and representing the rates of travel of the first traveler. The uniform rate of the second traveler is shown by bisecting AB at F and drawing EF and GF. And the intersections of these lines with the broken line ACDB are points, the ordinates of which represent the times and distances of the two meetings of the travelers. That is, they must meet at the times represented by AH and AI, after their first starting, and at distances from the first terminus (or starting point of the first traveler) represented by AI and BK, or from the second terminus, represented by IE and KG. All these quantities may now be read or measured direct from the diagram; and many other questions can be at once answered, as, at what time does the first traveler turn? Where is the first traveler when the second turns? How far apart are they when the first begins to run? How far when he resumes his walk? And so on, *ad infinitum*.

Mr. VOSE gives many instances of such constructions, and a number of examples for practice. His explanation of the manner in which the method is applied to railway time-tables, to determine the positions and passages of trains, is one of the most interesting. In that case, scarcely any other method would be practicable; certainly no equations or tables could be half as safe and convenient in use.

In going over the examples, we have noticed an occasional lack of precision in statement; and the following is a remarkable lapse in mechanics: "A siphon would empty a cistern in 48 minutes, while a cock would fill it in 36 minutes. *When it is empty both begin to act.* How soon" etc., etc.? Would not that siphon be a remarkable phenomenon?

THE ELEMENTS OF GRAPHICAL STATICS AND THEIR APPLICATION TO FRAMED STRUCTURES—*together with the best Methods of Calculation, etc.* By A. J. JAY DU BOIS, C. E., PH. D. New York, JOHN WILEY, & SON, 1875, with an Atlas of 32 Plates. Price $5.

This is one of the most complete treatises on bridge strains that has been published in English, and the author, in addition to a large amount of original work, has selected much that is valuable from other literature upon the subject. The primary object of the book, as implied by the title, is to explain graphical methods of solving problems in statics, although the author has treated the questions involved, from an analytical point of view, as well. The student who shares the somewhat prevalent belief that the graphical solution of problems is, so to speak, the lazy man's method, may be disappointed to find that the treatise under consideration can only be mastered by profound study. We are inclined to think, however, that this is due in large measure to the arrangement of the work, and that the graphical method in itself is necessarily simple. We will endeavor to make our meaning clear in regard to this point. It is generally considered by mathematicians that while satisfactory demonstrations of questions in geometry and mechanics can best be made by analytical methods, which are frequently intricate and tedious, the fundamenta expressions obtained by such investigations can often be graphically delineated

in a manner easily understood by those who have not mastered the higher analysis. The reader must be familiar with examples of this kind in geometry, where the properties of intricate curves can frequently be well illustrated by construction. Indeed, it seems to be undeniable that a graphical method alone, that is, the actual steps of the construction, will generally be simple, while, on the other hand, the reasons for these steps, and the principles on which the construction is based, may involve the use of very intricate operations.

We think, therefore, that in treating a method whose chief merit is supposed to be its simplicity, it would be well to present it in the simplest form, entirely detached from the analysis on which it depends. We make this criticism with much hesitation, for it is easy to see that the author of this work has a profound knowledge of the subject, and has produced a treatise that will take high rank in engineering literature. We observe that it has received very favorable notices from well known professors of engineering, and that, even in advance of publication, it has been chosen as the best book at three of our technical schools. The engineering profession, generally, will doubtless be interested in this, the first complete representation, in English, of methods which are received with great favor in Germany and France. We doubt, however, whether our bridge builders will be willing to admit the truth of the authors' implication, that they do not build continuous bridges because they can not compute the strains upon such structures. The reason is more likely due to the fact that they have carried their investigation of the subject somewhat further than the making of strain sheets, and have found that the mechanical difficulty and expense attendant upon the proportions found necessary for the end lacing, pins, etc., and the requirement that all chords be packed to resist both tension and compression, fully offset the economy due to the saving in weight. At all events, the proposition that continuous bridges were much more economical than those consisting of independent spans can not be maintained by the mere computation of the strains in the two cases. The same is without doubt true of the PAULI truss, which the author commends to the consideration of the bridge builders, for, admitting that its weight is considerably less than a parallel girder of the same span and strength, it is neverless evident that the details of construction involved are necessarily more expensive than those usually employed in American bridges. The bridge of this character, over the Rhine, at Mayence, Germany, is said to have cost an enormous sum. This form of truss, it may be further noticed, does not admit, when used as a through bridge, of the most efficient system of lateral bracing.

The author of the work under consideration apparently subscribes to the belief, so generally entertained by eminent physicists who have found time, of late years, to contribute to the literature of bridge building, that the computation of strains necessarily involves intricate analysis. The practical bridge builder, however, generally finds the making of strain sheets the simplest part of the operations which he is called upon to perform. It is the determination of the form of structure for a given site, the height, panel length, space, weights to be carried, and the details and dimensions of the various parts to economically resist the ascertained strains, which most exercises his ingenuity and skill. It is probably true that the higher mathematics must be employed in the case of continuous bridges, and some other exceptional structures, but only, we believe, in the fundamental operations of ascertaining the reactions, or position of points of inflection, as the case may be. We very much doubt whether the methods of computing strains defined in the elaborate treatise under consideration, will take the plan of the simple arithmetical and algebraic operations which bridge builders find all sufficient in proportioning ordinary structures, and if there is any reason why this work should not be adopted as a text book, it would seem to be upon this account.

A shorter and less elaborate edition of this book has been republished by D. VAN NOSTRAND, NEW YORK, (Price $2.), from the pages of his *Engineering Magazine*. Though this edition contains fewer applications of the principle to special examples, it will be found convenient by those who desire a general, rather than a special familiarity with the subject. It is unfortunate that the book should have been brought out by two publishers at the same time, and the explanations of the fact are as unfortunate as the fact itself.

On the Gases enclosed in Coals.

THOMAS has made an elaborate investigation of the gases occluded in coal, as well as of those which are evolved from fissures in the mines. The experiments were made upon the bituminous, or "house coals;" the semi-bituminous, or steam coals; and the anthracite coals; all from the South Wales basin. In the first series, slices of coal were sawn from the middle of large cubes and a strip, cut from the middle of each of these, $\frac{1}{8}$ of an inch square and 6 or 8 inches long. This was placed in a hard glass tube and connected with a Sprengel pump. Very little gas—only 2 or 3 cc. per 100 grams of coal—was liberated on exhaustion. The tube was then immersed in boiling water and kept there as long as gas was evolved. Additional quantities of gas were obtained at 200° and even at 300°. Upon analysis, the gases were found to consist of marsh gas, carbon dioxide, nitrogen and oxygen. The bituminous coal yields the least gas, though it contains a large percentage of carbon dioxide. Steam coals come next, their gas containing as much as 87 per cent. of marsh gas. Anthracite yields most gas, one specimen giving 600 cc. of gas from 100 grams of coal, at 100°, 1100 cc. at 200°, and 1875 cc. in all at 300°. In composition, these gases closely resembled those from steam coals. The gases collected from blowers in the mine, as well as from the coal itselt by boring, consisted almost entirely of marsh gas, rising in some cases to 97·65 per cent.—*Jour. Chem. Soc.*, II, xiii, Sept. 1875. G. E. B.

Method for the Quantitative Separation of Ferric Oxide, Alumina, and Phosphoric Acid.

HAVING occasion to analyse a minute quantity of a mineral containing ferric oxide, alumina, and phosphoric acid, FLIGHT took the opportunity to examine the various methods in use for the separation of these substances, the results of which are given in his paper. As a result, he was led, finally, to adopt the following, which gave all desirable accuracy: The solution of the above-named substances, which must not contain much free acid, is boiled for two or three hours with an excess of sodium hyposulphite (thiosulphate) and filtered. All the iron with some of the phosphoric acid is in the filtrate; all the alumina with some of the acid, is on the filter. The iron in the filtrate is thrown down by ammonium sulphide and determined as usual. The alumina precipitate is dissolved, and to the solution an excess of sodium hydrate is added, and then barium chloride, so long as a precipitate is produced. After standing a few hours, the solution is to be filtered. The phosphoric acid remains on the filter as barium phosphate; the alumina is contained in the filtrate, from which it may be precipitated in the ordinary way and weighed. A little caustic soda added to the wash water prevents the solution of the barium phosphate. The barium phosphate is dissolved off the filter, the barium removed with sulphuric acid, the filtrate mixed with that from the iron sulphide above, and the phosphoric acid determined with magnesia mixture, as usual. The author also points out that, the corrosive action, even of dilute solution of sodium phosphate, upon the glass of reagent bottles, is considerable, and may be a source of error in analysis. This salt cannot be obtained pure by recristallization in dishes of Berlin porcelain, from this cause.—*Jour. Chem. Soc.*, II, xiii, 592, July 1875.

G. F. B.

What is Steel?*

By A. L. HOLLEY.

THE general usage of engineers, manufacturers and merchants, is gradually, but surely, fixing the answer to this question. In every country rails, boiler-plates and machinery bars, whether hard or soft, are almost universally called steel, when they are made from *cast ingots*. Other names for the softer steels, such as "homogeneous metal," "Bessemer iron," "Martin iron" and the like, have failed to obtain general recognition.

The meaning of the term steel, before it was enlarged to cover newly developing varieties, has been traced, by a recent writer, down through PERCY, SHAKSPEARE and the Bible, in a most interesting manner, from an archiological point of view. Undoubtedly, it did characterize hardness and other qualities imparted by carbon. It is within the memory of most of us, that all steels were tool steels, and that the soft, structural varieties were introduced—varieties which harden but little, which bend cold, and which, in many physical properties, are akin rather to wrought iron than to tool steel. But, since both the hard and the soft steels are made by the same processes, and have their great, distinguishing structural feature in common, viz.: homogeneity resulting from fluidity, it has come to pass, despite every other proposed nomenclature, that all the compounds of iron which have been cast in malleable masses, are called steel, the term wrought-iron being still confined to malleable iron made from pasty masses, and hence laminated in structure.

No inconvenience has been found, so far, in distinguishing between the more or less carburized products, in general, by the terms "high-steel," "low-steel," "tool-steel," etc., and, in particular, by prefixing the percentage of carbon and other ingredients, to the term steel. Steels which contain distinguishing ingredients other than carbon, are called "chrome-steel," "titanium-steel," and the like, just as variously compounded bronzes are called "phosphor bronze," "aluminium bronze," etc. Thus the combination of several words or symbols, and figures, may completely disclose the characters of the metal, in terms that are subject to no misunderstanding.

But inasmuch as several high metallurgical authorities and clever writers have of late proposed to disturb this natural and somewhat settled nomenclature, it seems important to consider the claims of the various classifications. I shall attempt, in this paper, to show that the existing classification is more scientific and more convenient than any other, and that those others which have been most prominently brought into public notice are radically defective.

1st. The most common objection to the existing enlargement of the term "steel," so as to include the soft steels, is that it "pirates" a time-honored term, and applies it to a thing which is very different in many of its qualities. People who know nothing about steel, except as they use it in cutting instruments or read about it in classic authors, say that it is brittle, hard, and resilient, and they are much shocked to hear that it may also be soft and ductile; just as anyone who knows nothing about India-rubber, except in the form of springs, would be astonished to find that one change in manufacture turns it into water-proof clothing, and another, into hard, crystalline instruments and jewelry. The terms "hard-rubber" and "soft-rubber," as used in technical literature and commerce, have not given rise to any serious misunderstandings. People who do not know that the great bulk of the material made by steel processes, and having every ingredient and structural arrangement of the old steels, is, nevertheless, soft and ductile, and that it would be unsuitable for rails, plates, and the like, if it were not soft and ductile, are not to be considered authorities in this discussion, any more than a decorative artist in coal tar, would for that reason be an authority on aniline colors.

Where a material is gradually developed into new forms and qualities, there must be some general name to cover the various classes of metal; and whether it is better to enlarge the boundaries of the old one, or to arbitrarily make a new one, which new one must, from the nature of the case, merge into the old one, there being no natural dividing line, will be further considered throughout this paper. I venture to assert here that the charge, specially brought by the inventors of new definitions, against the existing use of the term "steel"—the charge of upsetting the recognized order of things—is wholly without foundation. Nobody *invented* the term "steel," as applied to the soft homogeneous products. There has been no natural or obvious place in the gradual gradation from hard to soft steels, to inject a new definition. As the possibilities of the crucible process were enlarged, the first soft product was hardly more than a variation from standard carburization; the early Bessemer and Martin steels, as produced in a successful commercial way, were hard, and, in fact, it is only quite recently that refractory materials have been adopted, by means of which the slowly receding standard of carbon in cheap steels, has reached a tenth of one per cent. The same general name has been thus necessarily preserved, for the products of the same process, but its boundaries have been enlarged to admit new varieties, and a gradual growth of sub-classification. So that what-

* A paper read before the American Institute of Mining Engineers, at the Cleveland meeting, October, 1875.

ever the merits of any arbitrarily devised nomenclature may be, it must bear the demerit, whatever that is, of upsetting existing order and development.

2d. A more common form of this objection is that a blacksmith would not recognize the soft metal as steel. "A blacksmith," it is said, "calls that steel which will harden and temper, and blacksmiths ought to know what steel is." There are various answers to this objection:

I. If familiarity with soft, coking coal teaches a blacksmith how to burn highly carburized anthracite in his smithy, then his knowledge of highly carburized tool-steel ought to teach him what soft steel is. Hard coal is none the less coal because it does not respond, like soft coal, to a blacksmith's coking process, nor is soft steel any the less steel, because it does not respond, like tool steel, to his hardening process. Anthracite coal was introduced long after bituminous coal was in general use and the "pirating" of the time-honored name "coal," to describe this material which is so different in many of its qualities, has not led to any vast inconveniences. It may be said that the parallel is incomplete, because both hard and soft coals are really the same thing only changed in composition and structure by natural processes, and that they both respond to the practical test—the influences of heat and oxygen. So are hard and soft steel the same thing, only changed in composition and structure by natural laws; and so do they both respond to the influences of heat and oxygen. Coals are, in fact, more diverse than steels in their carburization, structure and strength, and in their requirements of treatment. If old nomenclature is to be held as a final criterion, then the modern condensing steam engine should be a "low pressure engine." The fact is, on the contrary, that it is as often "high pressure" as any non-condensing engine.

The determination of previously unknown intermediate forms and functions is constantly enlarging the boundaries of all general classifications, and introducing sub-divisions; hence the criterion of old classifications is inadequate and worthless.

II. If hardening in water is the determining characteristic of steel, who is to define "hardening?" As a matter of fact, all products of the crucible, Bessemer vessel, open-hearth furnace and feeding furnace, containing about a quarter of a per cent. of carbon, will perceptibly harden in water, just in proportion to the carbon contained; and every one of them, however little carbon it contains, will harden in some degree, as far as existing tests can determine. "If the product will make a tool, it is steel," says the blacksmith. What kind of a tool? Is an agricultural tool iron, and a cold chisel steel; or does steel begin between cold chisels and razors, and if so, where? A water hardened tool perfectly adapted to certain uses may be made of Bessemer steel containing half a per cent. of carbon. The same Bessemer ingot may make a good rail. If one-half the ingot is steel, why is the other half iron? The line must be so defined that people will agree upon it. Does it lie between thirty hundredths and thirty-one hundredths of carbon, or between ninety-nine hundredths and one per cent.?

Obviously, no two men can agreee on the amount of any hardening element which may constitute steel. And if they could agree, it would only be after a quantitative analysis had been made in all close cases.

III. A recent writer in the ENGINEERING AND MINING JOURNAL (Aug. 28 to September 18, 1875) makes a number of ingenious objections to the use of the word "steel" for all compounds of iron which are cast into malleable masses.

I. The term "steel" is said to be so vague that some words must be added to it to indicate the very dissimilar classes of steel, and the necessity for this explanation is deemed objectionable.

This objection is best answered by its author, who says, in the same column, that it is desirabe to discriminate between the different classes of iron, and proposes the following brief and convenient nomenclature:—"Cast steel, welded steel, homogeneous wrought iron, homogeneous iron, welded wrought iron, puddled steel, puddled iron, blistered steel, Pessemer steel, Bessemer wrought iron, open-hearth wrought iron, Ucatius steel, Ucatius wrought iron, crucible steel, crucible homogeneous iron, etc." This classification, he says, shows whether the metal "has the properties given by carbon." Now, every one of these metals has properties given by carbon. The percentage of carbon must be mentioned anyhow, so why not briefly say twenty-carbon steel or forty-carbon steel, and so denote both its carbon value and its homogenity?

The objection, in its common form, is that the one word "steel" does not, without farther explanation, define the various classes of metal referred to. Neither do the words "oil," "coal," "rock," "brass," nor great numbers of general names express the sub-classes referred to; nor can any word nor any simple sentence define them all. The objection holds equally against all possible general classifications, and the only way to avoid it here is not to have any general classification in the iron business.

II. The writer referred to objects to calling the soft homogeneous compounds "steel," because it is sometimes difficult to tell whether they were made from cast or from pasty masses. It is true that a well worked puddled iron, rather high in carbon, and a low steel with about the same carbon, cannot be distinguished very easily by means of ordinary observation and simple tests.

I will in answer to this objection quote the same writer, who admits the impossibility of any perfectly adequate definition by saying that "classifications are based on important differences between the classes they separate, and not on the facility of distinguishing those classes sharply." Now there are important structural differences between puddled irons and cast steels which look alike—differences which will make themselves known after sufficient stress and wear; but is the difference between two steels varying only by a hundreth of a per cent of carbon, one of these "important differences," upon which an adequate classification may be based?

The real answer to the objection, however, is this:—Admitting for the sake of argument, that a considerable range of wrought irons and low steels cannot be distinguished by the observation of their fracture, nor by bending, nor by the usual quick mechanical tests—people do not largely purchase iron and steel by sampling individual pieces, as they would cigars; they purchase by specification of *manufacture;* for instance, the Pennsylvania RR. Co. specifies 0.35 carbon steel for its rails, meaningly "steel," that it shall be homogeneous or cast; and from 0.30 to 0.40 carbon is recognized by makers and users generally as the proper percentage for rails. I note this fact here, to correct the writer whose objection I am quoting. In trying to explain away the fact that such rails are recognized as steel, he says:—"railway managers do not care much about the degree of carburisation of rails said to be steel, provided they are absolutely weldless."

The practical usefulness of a name does not, therefore, lie so much in its discrimination between metals after they are made, as in specifying the method and quality of their manufacture. Rails, plates, bars, and iron and steel generally are ordered on the understanding that they shall be fabricated by processes and of ingredients which are known to have yielded certain endurances to long continued stress and wear. If purchasers do not themselves specify the ingredient and processes they want, they specify a name and grade of metal, such as "0.60 carbon Martin steel," which refers the manufacturer to such ingredients and process; so that the name completely meets the requirements of the case.

Supposing even that it should be, not difficult, but impossible to distinguish between certain grades of steel and wrought iron by the most searching mechanical and chemical analyses—it can probably be determined in all cases from synthesis. Lawsuits arise as to the composition of material substances about which we have no synthetical record, such as a late suit about a certain paving stone, based on the question as to whether it was trap-rock, or a sandstone altered by the trap rock that flowed over it. But there are almost always sufficient records of manufacture to determine whether a metal has been cast or welded. This, however, is an extreme case; perhaps it is, one that could never occur. Destructive tests can, I believe, determine in eve y case whether a metal was cast or welded. In the great majority of cases the most simple tests can distinguish iron from steel, as at present defined, so that practically, the existing classification is entirely adequate.

III. The writer we are quoting misinterprets the current definition of steel, as calling for a product which is *better* than wrought iron; and then he attacks the definition by saying:—"Who would call cold short Bessemer ingots, on the whole, superior to the best Sweedish iron?" Now as cold short ingots are altogether *nil* until they have been reconstructed, we must admit that "a living dog is better than a dead lion." The bearings of his observation do not lie in its application.

IV. Another objection from the same source, that the current definition excludes certain classes of iron heretofore called steel, such as "blistered steel," "puddled steel," etc,—is at first sight a valid one. But should not the same objection also be valid against the old and limited meaning of the term "steel?" Does the mere fact that "puddled steel," so called, is carburised more than the usual products of the puddling furnace, although less than tool steels—does this mere fact of a little more carburisation really define steel, according to the old restrictions of the term, despite the fact that the product, so called, has a totally different structure which renders it unfit for tools and for most other things that steel is used for? If then the term "puddled steel" should be excluded under the old classification, surely the classification now current must not be held responsible for its exclusion.

V. Again, classing homogeneous irons high in carbon and those low in carbon, under the same name—"steel"—is objected to, because the range of properties and uses due to variations in carbon, are much greater than those due to variations in homogeneity. Hence the classification, it is said, should be based on carbon and not on homogeneity. Every malleable iron, whatever it is called, contains carbon in some proportions, from a trace to the highest attainable solution, and since these combinations and the properties they impart, form a regular series of variations, running into each other, there can be no general carbon classification, except by drawing an arbitrary line at some carbon percentage. Now 1st, As the irons for some distance on both sides of this line cannot be thus distinguished, except by minute analysis in every instance; 2d. Since synthesis, which is the practical matter, cannot be based on a carbon specification alone, because it would omit the vital feature of homogeneity, upon which depend, for instance, the advantages of steel rails over iron rails; and 3d, since a classification based on homogeneity furnishes means for distinguishing between products, while it also affords, with the addition of the carbon percentage, a perfect basis for synthesis—for these reasons, I fail to see why a carbon basis, which must be arbitrary and revolutionary, could be useful or desirable. 4th, No less prominent an authority than Whitworth has proposed to divide wrought iron from steel at the point of twenty-eight tons tensile strength. This classification is open to all the objections we have urged against the equally unnatural and arbitrary carbon classification. How would Mr. Whitworth like to order gun steel by this definition? Any steel maker can produce a metal so full of phosphorus and silicon that it will fly into pieces under a sudden blow, and yet it will stand over twenty-eight tons statical pull. A steel made with very small proportions of carbon and manganese, to the almost entire exclusion of phosphorus and silicon, would safely stand the severest blows, and stretch perhaps thirty per cent before breaking, but still it might barely reach twenty-eight tons tensile strength. A puddled iron totally unfit for guns, plates and rails, might stand twenty-eight tons statical tension, while the most pure and costly product of the crucible might fail under it. The former, according to this classification, would be steel—the latter wrought iron. 5th, It has been stated that what is known as "malleable iron" will confuse the existing classification. Seeing that iron is remanufactured into malleable iron by a subsequent process, and not cast while in a fluid state into a malleable mass, as our specification demands, this objection is absurd. Without answering the more trivial objections, let us consider what we are to do if we give up the existing classification.

I. The old and restricted term "steel" indicated certain properties, such as resilience, hardness, etc., in an indefinite degree, which were imparted by that indefinite amount of carbon which gave hardening and tempering qualities. Now what shall we call the structural steels? We cannot call them wrought iron, because they have all the enumerated features, even hardening and tempering in a gradually lessening degree, as carbon is diminished; and the features are not characteristic of wrought iron. Besides, wrought iron totally differs in feature of homogeneity, and is rapidly growing out of use to make room for the homogeneous compound.

II. We may call these compounds "homogeneous iron," but we must then add the percentage of carbon, and designate them as "ten carbon homogeneous iron," up to say "fifty carbon homogeneous iron," for there is a vast range of grades and uses between these carburisations. Now, is it not easier to say "ten carbon steel" up to "one hundred and fifty carbon steel," thus including all the varieties of ingot metal? And is the general public likely to agree that "homogeneous iron" means metals made from ingots, up to a certain arbitrary point of carbon, which nobody can determine without analysis, when beyond this point, ingot metal, made in exactly the same way and by the same furnaces and processes is "steel?" The inconvenience of such a nomenclature is illustrated by certain streets in London, which are called by one name up to a certain number, and by another name the rest of the way—a very inadequate illustration, for one can sometimes find a label on a street, without making a quantitative analysis.

6. As the author referred to, whose objections I have endeavored to answer, has offered, not dogmatically, but for discussion, a new definition of steel, and has advocated its claims with much learning and ingenuity, I think we ought to examine it in some detail. He defines steel as "a compound or alloy of iron whose modulus of resilience can be rendered, by proper mechanical treatment,

as great as that of a compound of 99.70 per cent of iron with 0.30 of carbon can be by tempering." This is substantially an arbitrary division at the carbon point, .30 per cent., of all malleable iron compounds, whether made by wrought iron processes or by steel processes. The chief reasons appear to be, 1st, that this division somewhat corresponds to the distinction made between wrought iron and steel at a time when there were no soft steels; 2d, that the carbon point, 0.30 per cent., is a "somewhat critical point in the curve representing the degrees to which differently carbonised varieties of iron possess the properties which are most affected by carbon;" 3d, that resilience being the chief attribute of steel, it should for this reason form a basis of classification.

I. It is difficult to understand why scientific men should be willing to sacrifice a natural classification, which has grown out of the necessities of the case, for one that is unnatural and arbitrary, on the ground that it embraces species which are unlike the earlier species, although of the same genus. It is hardly necessary to repeat what has been said again and again in the foregoing pages on this subject.

II. If the 0.30 carbon point is a critical one, which I have not practically noticed, and which, for the purposes of this paper, need not be discussed, it is stated to be a point in a *curve*, which must be arbitrarily placed, and not the point of an angle, which might distinguish homogeneous from welded masses.

III. As to resilience being the most important quality of steels, and for that reason the proper basis of classification, it is unnecessary to discuss this claim for resilience here. The question is whether the importance of a quality can make existence of that quality a definite basis of classification when it exists in both classes, gradually increasing in one and decreasing in the other, and being practically the same near the dividing line.

To sum up once more, the answer to this and to all the cases of arbitrary classification: Exact definitions must be based on differences which always exist in every form and phase of the materials defined, and not on differences which, however great they may be in certain forms and phases of the materials, run together at one point, and there cease to be differences. If we divide steel from wrought iron by an arbitrary line of percentage of any ingredient or of modification due to any ingredient, there must be some point at which the difference between steel and wrought iron is infinitely small. If, however, we define steel as a compound made homogeneous by fusion, while wrought iron, although the same in composition, is heterogeneous from welding, there is always, and at every grade of the respective materials, a large and radical difference. Casting fluid steel and welding pasty iron are always distinct in their characters and results; they do not at any point shade into each other. The latter classification is therefore exact and complete.

IV. A very serious objection to the proposed division is that it occurs at a point about midway in the range of structural steels. It would be less inconvenient, though not less unscientific, if it divided the general class of structural steels from the more ordinary grades of tool steels. Of a pair of locomotive tyres, both made by the same process, out of the same materials, and containing as nearly as practicable 0.30 carbon, one might be steel and the other wrought iron; or, a pair of locomotive tyres might both be steel, the one having been welded up from scrap, and the other drawn from a cast ingot; or, one end of the same ingot might be steel, and the other end wrought iron, the first having been hardened, and the other annealed. The convenience of such a nomenclature is not obvious at first sight.

The author, of the proposed definition we are criticising, has so vividly portrayed the disastrous confusion which would arise from changing a settled nomenclature that I can hardly do better than quote him in this connection. He says: "it is a complete change in the meaning of a word that is in every man's mouth—a change in which the interests of the whole civilized world are affected, and in contemplating which, the convenience of all mankind is to be considered.* * The natural conservatism of language would prolong this painful period of change, to a most unpleasant length Moreover, the confusion would not end, till the change had been well established in the other languages of the civilized world. In meeting the word 'steel,' in specifications, contracts, and, indeed, all literature, whether technical or not, whether English or foreign, it would be necessary to determine whether it had been written before or after the change had been effected."

In conclusion, it seems hardly necessary to *again* sum up what has been chiefly a reiteration, in different forms, of answers to criticisms on the present enlarged use of the term "steel," and of the one great objection to the nomenclatures, that they are fatally indefinite.

The names of new materials and processes, like the laws of trade, are not fixed by the arbitrary edicts of philosophers, but, they are gradually developed, to meet the general convenience.

DISCUSSION.

Mr. PEARSE said he objected to the definition of steel proposed in the paper, on two grounds:

First, the fact that the definition of steel, proposed by Mr. HOLLEY, is not an old one, nor an established one, but one of comparatively recent introduction in popular language, and which might be called, a *new*-old one, with great propriety. The old, and generally received, classification of steel is based on the work of KARSTEN—a man of the exactest practical knowledge—a director of government works, and not a philosopher nor a theoretical speculator. He found that, under the same conditions and by exactly defined methods, a compound of iron and carbon with a given amount of carbon would harden, to an appreciable extent, and that, just below this point, similar compounds would not harden. He specified 0.25 per cent. carbon as the limit.

Now the point at which, under exactly similar conditions, one metal will harden and another will not harden requires no quantitative analysis to determine, and but a few minutes of time. At his anvil, an ordinary smith, at Neuberg, grades and classifies steel to correspond with the chemical and physical tests. This being the case the distinction, on which the old received definition is based, must be acknowledged to be both *practical* and *easily recognized*.

The steel carries its own label on its face, as easily read as the name of a street.

SECOND, in the paper read, the President pointed out that Sir J. WHITWORTH proposed 28 tons tensile strength as the dividing line between iron and steel. This is only another way of designating the point that has been in the mind of all who have recognized the dividing line, some having of course approached the truth more nearly than others. The exact truth is that besides having a metal that will harden under a given treatment, we have a metal that will soften and become more ductile under exactly similar treatment: this metal is a compound of iron and carbon with about 0.17 per cent. carbon. The fact that it softens under exactly the same conditions as the other metal hardens, proves that we have a different substance, viz. *iron*. There is no doubt about this fact for I have in my possession bars thus treated, which show the fibrous silky fracture of wrought iron, while the same metal containing a little more carbon shows, when similarly treated the granular chonchoidal fracture of steel. Here then is the point; it is fixed by no philosopher but by the *nature of things*, the term homogeneous metal is in general use, if one is not willing, as one ought to be, to call the product iron.

Mr. PEARSE said that so far as *true steel* was concerned, he agreed with the President that the best way to designate the steel was to prefix the carbon percentage, and he had advocated similar views in his paper on iron and carbon read at the previous sitting. He did not agree with Mr. HOWE that resiliency was the characteristic property of steel, nor with the President that homogeneity was that property.

Dr. R. W. RAYMOND referred to the fact mentioned by Mr. COGSWELL, that tool steels heated to a certain temperature soften in water, and said the behavior of the metal evidently depended on the initial temperature of the metal and liquid, and the rate of cooling, as well as on the the contents of carbon or other "hardening" element. With regard to the able and ingenious paper of the President, he said that the real question seemed to be rather, "What is *real* steel?"—one party having denied this name to the Bessemer and Martin metals, the other retaliates by carrying the war into Africa, and giving us a definition, "any cast, malleable alloy of iron," thus excluding among other things, blister, shear, and puddled steel. The President's comparison with the case of anthracite and bituminous coal would be more complete, if the anthracite owners had denied that bituminous coal was coal at all. He had no objection to permitting the Bessemer and Martin products to be ranked as cast steel. It was inevetiable and also right. But a definition which demands that blister steel, the thing which always was steel, shall be suddenly voted iron, certainly calls for pause.

Prof. EGLESTON said that the experiment of fusing wrought iron in crucibles was successfully carried out in St. Etienne in France about the year 1846, and castings made of this fused iron. Did this simple process of melting convert iron into steel?

Chromeisen, and some other Alloys.

By SERGIUS KERN, St. Petersburg.

EXPERIMENTS have proved that, by using chromeisen instead of spiegleisen, extremely soft steel is obtained; rods made for experiments were very easily bent, even by hand. It is seen, from these attempts to replace spiegeleisen by chromeisen, that the use of the chrome-iron alloys is limited, and the steel obtained is for most purposes too soft for the manufacture of such materials as rails, axles, tyres, etc.

During some experiments with the chrome-iron alloys, a strange phenomenon was observed. It is well known that chromium is extremely hard, and scratches even hardened steel; meanwhile, an alloy was obtained which was malleable, and in a fresh state could be easily bent. It was also remarked that sometimes in opening the crucibles nothing but slag was found, but, in breaking the crucibles, the alloy was found to be in the bottom of them. That may be attributed to the corrosive properties of the liquid alloy, which often penetrated even through the bottoms of plumbago crucibles.

The above-mentioned alloy was analysed, and the following average composition was found:

Metallic iron	96.40 per cent.
Metallic chromium	2.03 "
Carbon	traces
Lime, Silica	1.30 per cent.
	100.00 per cent.

(2). By melting a mixture of cast-iron, tin, and lead in the following proportions, a very liquid alloy is obtained:

Cast-iron	79.00 per cent.
Tin	19.50 "
Lead	1.50 "
	100.00 per cent.

The alloy has a handsome appearance, and fills perfectly well the casting-moulds; thus it could be used for casting small articles. The alloy is to some degree malleable.—*Chemical News.*

The Nickel Mines of New Caledonia.

Mr. JOHN HIGGENSON, of Noumea, New Caledonia, threw open for inspection, on Monday, a large quantity of nickel ore from the celebrated Bellar Mine. The lot inspected is the second shipment from this mine, and consists of 150 hogsheads. It seems the ore from this mine is altogether a new ore, being a very pure sample of hydrate silicate of nickel, and it is said will assay a very high percentage. Mr. HIGGENSON, who is interested in a great number of the principal mines in New Caledonia, being very much dissatisfied with the returns received from England of ore from the Mont d'Or mines sent home for treatment, has resolved to erect smelting works in Noumea. Commissioner CLUNY, of the mining department in New Caledonia, has assayed a portion of the ore of the kind exhibited, the publication of which is reserved until Professor LEVERSIDGE, the Rev. W. B. CLARLE, Dr. LEIBUS (of the Mint), and Mr. J. G. LATTA, have given their results. The intention of Mr. HIGGENSON, after getting assays from these gentlemen, is to have a consultation, and learn if any difficulty exists as to the treatmeat of the ore, he has been assured already that no difficulty exists, that a simple smelting process should suffice, the ingredients being silica, water-nickel, with a tincture of magnesia and iron. The reports received from Europe as to the consumption of the metallic nickel are very encouraging. It is especially prized for its hardness and non-corrosive properties, and when brought into an oxide it produces colors used very extensively in fireworks, and in the manufacture of French chintzes, cambrics, etc. The prices quoted range from 11s. to 12s. per lb., but probably that price cannot be obtained for large quantities. The proprietors of other nickel mines in New Caledonia, look forward with great expectation to the enterprise of Mr. HIGGENSON in the erection of works, as they could then send home the metallic nickel, and get immediate advances either in Sydney or Melbourne. By the present system of exporting the ore we learn that results cannot be obtained for at least 15 months. It is said that there are at most not more than half a dozen nickel mines at work in the world. A large increase in the quantity produced would, of course, bring down the price, but on the other hand, a great cheapness of the article would increase its use in manufactures. In any case these nickel mines promise to be a great source of wealth to New Caledonia, and to help to increase the trade between that colony and Sydney.—Sydney *Morning Herald.*

Some Observations on the Comstock Mines, and the Method of Working them.*

BY DAVID COGHLAN.

THE famous Comstock lode is situated in the centre of a group of mountains composed of igneous rocks. At first sight the fissure in which it was formed would seem to have been caused by the upheaval of the range of which Mount Davidson is the central feature, as it runs North and South, along the Eastern part this chain ; but further examination makes us doubt this supposition, as, in that case, the underlay of the vein would be West or at least perpendicular, not East as it is, else the effect of the upheaval would be to close, not to open the fissure. On looking a little farther off for the cause of the phenomenon, we observe that a circle with a radius of 5 miles struck from Mount Davidson, the highest point of the group of mountains, will reach the plain all around except on the N. E. where a low range of hills branches off, thus showing it to consist of a dome-shaped elevation (taken as a whole), rising some 4,000 feet above the surrounding plateau. Now the effect of the elevation of such a dome by forces acting on liquid matter below would be to form cracks in the central part of the surface. And the roughly radial position of the Comstock itself, and its associated veins, would seem to support this hypothesis. The rocks occuring in the neighborhood consist of Syenite of which the country west of the lode mainly consists. A porphyritic rock called locally "Propylite" forms most of the eastern country near the vein. This is tolerably hard, and of a bluish or greenish color, except near the principle veins where it becomes yellowish and friable, having no doubt been partially decomposed by the chemical action, or heat, which formerly operated in the fissures during the formation of the veins. An amygdaloidal formation is often perceived in this rock. This difference in the rock at either side of the vein would seem strange did we not remember that the chemical composition of most of the igneous rocks is nearly alike ; those in this neighborhood consist mostly of quartz, felspar, and hornblende. Regarding these rocks LYELL says : "The minerals which constitute alike the granitic and volcanic rocks, consist almost exclusively of seven elements, namely, Silica, Alumina, Magnesia, Lime, Soda, Potash, and Iron. And these may sometimes exist in about the same proportions in a porous lava, a compact trap, or a crystalline granite. It may perhaps be found on further examination—for on this subject we have much to learn—that the presence of these elements in certain proportions is more favorable than in others to their assuming a true granitic or crystalline structure, but it is also ascertained by experiment, that the same materials may, under different circumstances, form very different rocks. The same lava, for example, may be glassy or scoriaceous or stony or porphyritic, according to the more or less rapid rate at which it cools, and some trachytes and syenitic greenstones may, doubtless, form granite and syenite if the crystallisation take place slowly."

The width of the Comstock seems to be greater on the surface than in depth, some of the crossings being as much as 300 or 400 feet wide. In the deeper parts of the vein it varies from 100 to 300, but much of this width is composed of non-crystallized ingredients which can hardly be strictly called veinstone. The only lodes I have seen which can approach it in size are the Veta Madre of Guanajuata, the Veta Grande, and Quebradilla vein of Zacatecas, and the Veta Madre of Catorce, in Mexico, and even these do not equal it in width, on the surface, at least. The Comstock is estimated to have produced $200,000,000 since its discovery some 20 years ago. This is a vast sum, yet inferior to that of one mine alone on the Veta Madre of Guanajuato, (the Valenciana), which, in the end of the last century and the beginning of the present, yielded $250,000,000. However, the Consolidated Virginia alone is at present yielding, and likely to yield for a good while, some $20,000,000 annually, and the total produce of the Comstock cannot fall short of $25,000,000, or about as much as the whole Mexican Republic produces.

The California, the adjoining mine to the Consolidated Virginia, promises to be even richer, but cannot be worked to any great extent at present for want of facilities for extraction. A new shaft, the C and C, is being sunk as rapidly as possible for this object. The Consolidated Virginia has been producing about $1,500,000 monthly for the last year, and declaring dividends of $1,080,000. In September, 1875, the amount produced was $1,812,000, and the California will, no doubt, rival this when it starts. These two mines, as well as the Utah, Gould & Curry, Savage, and Hale & Norcross, are controlled by the firm of FLOOD & O'BRIEN of San Francisco, and MACKAY & FAIR of Virginia City, and are under the able management of JAMES G. FAIR. Most of the remaining mines on the lode are controlled by the Bank of California. The Consolidated Virginia (Bonanza mine) is, without doubt, the richest mine in the world at present, and will continue so for some time if not rivalled by the California. The ore has been found at a depth of between 1,300 and 1,600 feet from the surface, and is said to sometimes attain a width of 300 feet. The Savage and the Hale & Norcross have reached a depth of over 2,200 feet, and it remains to be seen if the vein will produce rich ore at this depth. There is a winze in the Savage mine sunk 250 feet below the bottom level, so that the mine is in fact nearly 2,500 feet in depth.

There seem to be no cross courses or heaves to trouble the miners on the Comstock. All the fissures seem to have been filled with metallic deposits. The ores are very docile, being treated with great ease, and they much resemble those of Guanajuato, though the quartz in the former is friable and easily broken, while in the latter it is exceedingly hard. The ores extracted from the Consolidated Virginia yield about $100 a ton, of which three quarters is silver, and one quarter is gold ; 650 tons are extracted and beneficiated daily. These would be considered but good middle class ores in Mexico, but the enormous quantity makes up for the want of richness. All classes of the ore, rich and poor, are mixed into one uniform grade, which is rather a strange proceeding, but is probably done to avoid loss by theft. Certainly the treatment of the different classes might be advantageously varied, and the richer portion subjected to smelting rather than amalgamation, were the separation made ; even the system of amalgamation might be varied to suit the different classes. The amount of ore extracted daily from the Consolidated Virginia, is somewhat more than half the quantity of coal raised and prepared for market at a first-class Pennsylvania colliery, but it can be safely said that from no one Mexican mine could more than one-fourth of this quantity be raised and beneficiated.

In Nevada the expeditious system of milling enables a vast quantity of ore to be treated, though but from 70 to 80 per cent. of the precious metals are extracted. The Consolidated Virginia employs, counting mine and mills, some 2,700 hands, who get $4 daily wages. This seems a very high rate of wages, but we must consider that the necessaries of life are also high, and that the coal miners in the anthracite regions of Pennsylvania, where living does not cost more than half, made equal wages for many years.

The system of working the mines, underground, is by driving levels at a vertical distance of about 100 feet, along the hanging wall of the vein; these are connected at intervals by winzes, and cross-cuts are driven at different points on each level towards the footwall, or at times, instead of cross-cuts, a diamond drill hole is used, the sediment from which is separated at stated intervals and assayed, so giving a rough idea of the richness or poorness of the vein. This latter method, in addition to the inducement of economy and saving of time, affords an easy means of stopping any sudden influx of water, by plugging.

Where the vast bunches of ore are met with, a peculiar system of timbering is adopted. The best way to imagine this is to suppose a number of cubes, eight feet on each face to be laid side by side, eight to twelve inch pieces of timber form the edges of these cubes, the top of each upright piece being cut to receive four cap pieces which radiate from it. As the ground is worked out these cubes are added in a horizontal direction till the whole width and length of the deposit is reached. On this layer of cubes is begun a floor of like cubes resting on the previous ones, and so on, floor after floor, till the top is reached and all the ore excavated. This system is, I believe, peculiar to the Comstock, where the vast width of the deposits require some such system. Of course the consumption of timber is enormous, and the outlook regarding the supply of this indispensable material is not encouraging, as the only timber which grows within many hundred miles is on the Sierra Nevada, and this is being ruthlessly sacrificed, without any care for the morrow, and there must come a period of scarcity, such as exists in Mexico at present, particularly when we consider that the wood used for fuel, is even, greater in quantity than that for timbering. The nearest available coal is that from the Rocky Mountains, of a poor quality, and costing $19 a ton. The wood is supplied to the mines at $11.50 a cord.

A peculiar way of extracting the wood from the recesses of the Sierra is practised here, and an important work of this nature was recently finished, for the firm of FLOOD, O'BRIEN, & Co., for the supply of their mines. A flume fifteen miles long was built, with a descent of about one inch to the foot. It is formed of two twenty-four inch boards, nailed in a V shape, and resting on tressles, or on the ground. A stream of water floats down logs and firewood. It has a capacity of 500 cords of wood a day, or of 500,000 feet of lumber.

A very strange system of driving dead ground is universal here, which would seem to be against the interests of the mine owners, and which is, I believe, practised nowhere else, viz. : levels, shafts, winzes, &c., are driven by days work, each miner being supposed to plan the holes he drills to the best advantage, and certainly the amount of ground driven is extraordinary, and must be atttributed rather to the use of giant powder than to the system followed or the skill of the miners. The force of explosion of giant powder is so great that it tears the hole to the bottom, though unskilfully planned. The system of working by the day on ores, when rich, is common in all mining districts, and in that case has some obvious advantages over "Tribute ;" but driving dead ground in this manner seems anything but economical. The miners work in three shifts of eight hours. A strange peculiarity of this vein is that it swells on exposure to the air, much as quicksilver does, so that, when a level is secured with strong timber, say from eight to twelve inches square, the timbering will get crushed by the irresistible expansion of the ground after a few months, and assume such an appearance as would indicate imminent danger in most other veins, where the squeeze of the ground is continuous, but here it will stand for a long time in this state, the expansion ceasing after a certain time, and when it reaches this stage of "eased," as it is locally termed, or new timber put in at the parts most damaged, the timbering will last for many years.

The two most troublesome features in mining here are the amount of timbering required and the great heat of the workings. Whether this heat is caused by chemical action, or by simple approach to the heated central mass of the earth is, I think, an undecided question, though the latter is the most probable cause, as no doubt the crust of the earth is thinner than usual along the range of the Sierra Nevada, which has probably been upheaved along a line of least resistance. Even in Europe, the temperature corresponding to a depth of 2,000 feet, is very considerable. Most of the mines have ventilating engines, the air being *pushed* down the shafts through sheet iron tubes, and distributed where most wanted through pipes. This is the reverse of the coal mining system of extracting the air by *suction*. The disadvantages of the first system, when using the mine level as tubes, as is done in the coal mines, is obviated by the use of the smooth iron tubes, which cause comparatively small friction. The volume of air thus forced into the mines is trifling compared to that required in a coal mine. Indeed the principal use of fresh air in these mines is to cool down the temperature, rather than to remove any foul or injurious gases. The miners have to relieve each other at very short intervals where there is not free ventilation, the heat being so oppressive, and the water which issues in some places is sufficiently hot to scald the hand. The natural ventilation formed by difference of level in the mouths of shafts, and the different temperature in different mines is considerable, and most of the mines being communicated on the lode this helps very considerably. Brattices are used for carrying the ventilation into advanced headways. The shafts are generally sunk perpendicular to cut the vein, and when this is attained they are carried down on the underlay to avoid the extremely hard syenite rock which occurs on the footwall. The Comstock underlays east at an angle of 45° from the surface to a depth of some 1,300 or 1,400 feet, where it increases its pitch to an angle of about 70° with the horizon. The general size of the shafts is 20x6 feet, with three divisions, two for hoisting and one for the pumps, or where pumps are not used, all three for hoisting. The new combination shaft being sunk by the three mines, Chollar Potosi, Hale & Norcross, and Savage, is 30x9 feet, and is the largest in the district. This is intended to cut the vein at a depth of 4,000 feet, but it is very questionable if men can work at that depth, considering the excessive temperature which will probably be encountered. The safety-cages used in the shafts are of nearly the same construction as those in use in the Pennsylvania collieries, but a spring works the eccentric rollers, which, in case of breakage, catch the guide rails, instead of the gravity arrangement which works them in Pennsylvania. In the underlay shafts or "inclines," as they are called here, a safety-cage adapted to the altered circumstances is also used. Where the hoisting capacity of a shaft has to be increased an arrangement called a "double-decker" is used, it being simply two cages, one underneath the other, on which two of the mine cars are hoisted. The cars are mostly made of sheet iron, and are most serviceable and light. The guage is eighteen inches, and they contain from one quarter to one half the weight a Pennsylvania coal car with three foot guage, does, and last, probably, four times as long as these clumsy wooden cars. The ropes used in the shafts are mostly flat steel wire ones, about 5x¾ inches, and weigh three and a quarter pounds per running foot, thus the rope in the Hale & Norcross,

* A paper read before the American Institute of Mining Engineers, at the Cleveland Meeting, October, 1875.

or the Savage, which works in the "incline," weighs about four tons, not counting car or load in car. The advantage of the flat ropes is that the leverage on the reel is proportioned to the load raised. Round ropes are sometimes used, but on conical drums, not on those of equal diameter at both ends. A very ingenious and useful contrivance I have not noticed elsewhere is a moveable cover of lattice work, to cover the shaft, which is raised every time the safety-cage strikes it, and falls into its place again on the descent of the cage, thus avoiding any danger of accident to the men around the mouth of the shaft.

(TO BE CONTINUED.)

Illuminating Gas.

Address by Prof. CHANDLER, before the Gas-Light Association.

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PRODUCTS OF THE DISTILLATION OF COAL.

As in all cases of destructive distillation we have four classes of products:

1. The Gases and Vapors.
2. The Water.
3. The Tar.
4. The Coke.

The products are very complex in composition, more than a hundred chemical compounds occur in them.

[Here followed a list of all the known luminant hydrocarbons, the impurities of gas, including the gaseous, ammonia water, the components of tar, etc., a list more curious than useful.]

THE YIELD OF GAS COALS.

The quantities of gas, ammonia water, tar and coke obtained from coal, vary according to the quality of the coal, and the character of heats. Prof. J. LAWRENCE SMITH, in his able report on the Paris Exposition, gives the following figures from the Imperial gasworks, in Paris, for the year 1866:

Coal carbonized.....421,000 tons.	Tar, per cent..... 5.356
Gas obtained..... 4,320,491,244 cub. ft.	" lb. per ton of coal 119.97
Feet of gas per ton...10,262·5	" U. S. gals... ... 12.6
Tar..... 21,540 tons.	Ammonia products...3,000 tons.

This table, from the British *Journal of Gas-Lighting*, is interesting in this connection:

TABLE of the Products per ton of Coal Carbonized, realized by the Metropolitan Companies, in Year 1870.

Name of Company.	Coke per ton of coals, in bushels.	Breeze per ton of coals, in bushels.	Tar per ton of coals, in gallons.	Am'oniacal Liquor per ton of Coals, in gallons.
Chartered	21.86	2.60	9.32	18.77
Commercial	25.76	3.63	8.31	13.78
Eqitable	26.07	2.56	10.85	22.86
Imperial	26.53	4.05	8.38	13.52
Independent	20.45	1 14	9.70	13.08
London	29.36	3.21	9.24	12.08
Phœnix	28.67	1.80	9.67	17.80
Ratcliff	23.58	2.79	8.96	19.55
South Metropolitan	24 66	5.10	9.07	17.38
Surrey Consumers	24.81	1.58	7.45	11.28
Western (cannel only)	8.18	7.46	12.16	12.43
Average	24.44	3.33	9.14	15.60
Average, excluding Western Co.	25 28	3.12	8.99	15.76

PURIFICATION.

The next thing in the operation of gas-making is purification. The impurities which are not separated from the crude gas, either in the condenser, washer, or scrubber, are all more or less objectionable. All the sulphur compounds produce sulphurous acid, and, probably, some sulphuric acid, when the gas is burned, which vitiate the atmosphere and may even cause serious damage to books, silks and other textile fabrics. Ammonia is objectionable, because it attacks the fittings, corrodes the meters, and fixes the stop-cocks. It also has the property of holding tar in suspension. When burned, it is partially converted into nitrous acid. Ammonia is, in some respects, advantageous; it unites with the sulphuric acid produced during combustion, and forms harmless sulphate of ammonia; and it is also said to prevent the deposition of naphthaline in the mains. The nitrogen and oxygen which are generally present in gas, are supposed to be entirely due to atmospheric air, which, unavoidably, gains admission when retorts are charged, purifiers changed, etc. Nitrogen diminishes slightly the illuminating power of the gas, as it absorbs a portion of the heat of combustion, without contributing either heat or light. It may also form nitrous or nitric acid, and thus vitiate the atmosphere. Oxygen is more objectionable than nitrogen, it diminishes the illuminating power of the gas very materially. Carbonic acid also occasions a considerable loss of light: one per cent. of this gas is said to diminish the illuminating power of coal gas five per cent.

This table, which I show you now, prepared by FIRLE, indicates the per centages of the impurities at different stages of the manufacture at Breslau:

In the Gas from—	Carbonic Acid.	Sulphuretted Hydrogen.	Ammonia.
1. The Condenser	3·72	1.06	0.95
2. The Scrubber	3.87	1.47	0.54
3. The Washer	3.39	0.56	0.00
4. The Laming purifier	3.33	0.36	0.00
5. The lime purifier	0.41	0.00	0 00

A. BUHE (*Jour. fur Gasbeleuchtung*, 1869, 420) has given more elaborate statements, among which are the following:

GAS FROM ZWICKAU COAL.

In the Gas from—	Carbonic Acid.	Sulphurette Hydrogen.	Cyanogen.	Ammonia.
1. The hydraulic main.	2.91	.23	.07	1.10
2. The condenser	3.88	.40	.07	.24
3. The scrubber	3.86	.44	.06	.15
4. The washer	3.64	.34	.09	.04
5. The purifiers	4.11	.00	.00	.00

GAS FROM NETTLESWORTH (ENGLAND) COAL.

In the Gas from—	Carbonic Acid.	Sulphuretted Hydrogen.	Ammonia.
1. The hydraulic main.	1·10	0.19	0.70
2. She condenser	1 04	0.09	0.88
3. The scrubber	1.00	0.10	0.66
4. The washer	0.98	0.01	0.39
5. The purifiers	1.13	0.00	0.00

METHODS OF PURIFICATION.

There are four methods of purifying gas now in use:

1st—*The Wet Lime Process.*—This process involves passing the gas through milk of lime. It is the oldest process in use, and is very effective in removing both the sulphur compounds and the carbonic acid. It has been generally abandoned, however, on account of the difficulty of disposing of the foul milk of lime called "blue billy." Occurring as a liquid, the "blue billy" is not easily transported, and as it does not rapidly undergo oxidation, it is not well adapted for use as a fertilizer. Running it into rivers and streams has been forbidden by law, as the pollution of the waters by it was intolerable, while the extremely offensive smell which it emits, makes it impossible to store it until it becomes dry enough for transportation.

2nd—*The Dry Lime Process.*—In this process dry, or slightly moist hydrate of lime is placed on trays in iron boxes, through which the gas is made to pass. This process is very effective, and has very generally superseded the wet lime process. It removes the sulphur compounds and the carbonic acid equally well. When the foul lime is removed, however, it evolves the same odor which caused the wet lime process to be abandoned. When exposed to the air it rapidly undergoes oxidation, becoming heated in consequence. During this process it evolves sulphide of ammonium, and some other compounds, whose exact nature is not known, but whose odor is extremely offensive. This is the cause of the "gas nuisance" so loudly complained of a few years ago, when all the New York companies employed this process of purification. After the oxidation of the foul lime is completed, it ceases to be specially offensive, the peculiar stench being evolved during the first hour or two of exposure. The offensiveness of this foul lime became such a constant cause of complaint in the large cities of Europe, that the gas companies were compelled to abandon the process, as they had previously abandoned the wet lime. A system of ventilating the foul lime has been invented, and is now in use at both the stations of the Manhattan Company in New York, which effects its oxidation in such a manner that the offensive gases evolved are not permitted to escape into the atmosphere, but are passed through a washing apparatus, and, finally, through a special purifier, by which they are rendered comparatively inoffensive. This invention seems to obviate the nuisance of dry lime purification.

3rd—*The Laming Process.*—In 1849 Mr. LAMING introduced the hydrated sesquioxide of iron, as a substitute for lime, for purifying gas, and prepared it of a suitable quality, by mixing copperas (sulphate of iron) with slaked lime and sawdust, and exposing the mixture to the air to oxidize the protoxide of iron to the sesquioxide. The resulting mixture contains hydrated sesquioxide of iron. sulphate of lime and sawdust. When an excess of hydrate of lime is employed, the resulting mixture contains this substance also. This material is very effective in removing the sulphur compounds from the gas. There is, however, some difference of opinion as to the completeness with which the carbonic acid is removed, due, perhaps, to variation in the proportion of the ingredients. Two important advantages attend the use of this mixture—first, when fouled it does not evolve offensive odors when exposed to the air; second, by exposure to the air the sesquioxide of iron, which has been changed to sulphide of iron in the purifier, is regenerated, the sulphur being liberated, and sesquioxide of iron again formed. The mixture may, therefore, be used again and again, till it becomes so clogged with the sulphur liberated, that it does not act promptly on the gas. It is then found to contain from 40 to 60 per cent. of sulphur, and may be used for the manufacture of sulphuric acid. I have seen mixtures which had been in use twelve months.

4th—*The Iron Ore Process.*—A few months after LAMING introduced the artificial sesquioxide of iron in France, Mr. J. M. HILLS applied the natural hydrated sesquioxide of iron, or "bog iron ore," in England. This material, like the Laming mixture, may be used again and again, and does not evolve offensive odors when exposed to the air. A modification of this process is now used by the New York Gas Company. It was invented by Messrs. ST. JOHN & CARTWRIGHT, and has been in use nearly seven years, giving entire satisfaction. As the bog iron ores of this neighborhood are not sufficiently pulverulent to act promptly on the gas, Messrs. ST. JOHN & CARTWRIGHT add to the ore a quantity of iron borings or turnings, which they then convert into an artificial hydrated sesquioxide of iron, moistening the whole with ammoniacal liquor, and exposing it to the air. The resulting mixture of natural and artificial oxide, receives an addition of coarsly pulverized charcoal. This mixture is always sprinkled with ammoniacal water before it is placed in the purifier. In Germany several varieties of sesquioxide of iron are now in use, prominent among which are "the Oberuseler mixture," an iron ore containing some oxide of manganese; the "Mannheim oxide," and "Eeicke's oxide," very pure artificial oxides of iron.

Extent to which the Different Methods of Purification are Emp'oyed.—The wet-lime method has been almost entirely abandoned. The only works at which I know it to be used, at present, are at Cork, in Ireland. These works are of moderate size, and are situate out of the city. Moreover, the gas is freed from ammonia by means of sulphuric acid, before it comes in contact with the lime. The foul lime does not, therefore, evolve sulphide of ammonium when exposed to the air. The dry lime process, though still in general use in this country, has been almost universally abandoned in Europe—abandoned, firstly, because the foul lime was an intolerable nuisance; secondly, because the process is too expensive, as the lime can be used but once, and when exhausted has but a trifling value as a fertilizer. The Laming mixture is now used in some of the European gasworks. All the gas supplied to Paris is purified by this material. The German gas engineers have found that this mixture owes its efficacy entirely to the oxide of iron which it contains, and that the sulphate and hydrate of lime present do not take any appreciable part in the purification. Hence they are abandoning this mixture for the artificial oxides of iron, which are cheaper and more efficient. The iron ore method is now most generally used in Europe, and has obtained a foothold in this country, being used by the New York Gas-Light Company, the Harlem Company, and several companies in Massachusetts and elsewhere. All the Liverpool gas, much, if not all, of the London gas, and that of most of the German cities, is now purified either by iron ore or one of the artificial oxides of iron.

Comparative Advantages of the Different Methods.—The lime methods effectually remove the carbonic acid, and reduce the sulphur compounds to a minimum. Were there no objection to the use of dry lime, on the score of cost or offensiveness, I think this agent would be generally preferred. Lime was first abandoned on account of the nuisance which it occasioned, but the iron oxides are now actually preferred by the European gas engineers on account of their greater economy. Mr. KING, the engineer of the Liverpool works, assured me that the oxide of iron purification, which he had used exclusively for the past seven or eight years, costs less than half as much as the dry lime process used previously. Two objections are urged against the iron methods by those who are prejudiced in favor of lime. First, they do not remove carbonic acid; second, it is claimed that they do not remove the sulphur compounds as completely as lime. The first is generally conceded to be true. But the only objection to carbonic acid is that it reduces the illuminating power of the gas; 1 per cent. of carbonic acid diminishes the illuminating power 5 per cent. The average quantity of carbonic acid is, say 2½ per cent.; then the illuminating power of the gas will suffer to the extent of 12½ per cent., or one-eighth. There are two ways in which this difficulty can be effectually met: First, by using better coal for making the gas, or adding a few pounds of rich cannel or some other enriching material to the ordinary gas coals; or secondly, by taking less gas from the coal. The last gas drawn from the coal is always inferior to that which comes off first. MR. A. BUHE, already referred to, says: "It has become more and more the custom to leave the carbonic acid in the gas, and to neutralize its bad influence on the illuminating power by taking less gas from the coal, thus getting a better gas." Dr. SCHILLING says: "Carbonic acid is of no consequence to the consumer; cannel coal is the remedy." The second objection to the iron processes is the alleged imperfect removal of the sulphur compounds. None of the methods in use entirely remove the sulphur from the gas. The question arises, therefore, how much sulphur can be safely left in the gas? The English Parliament has answered this question by fixing the limit at 20 grains of sulphur to the 100 cubic feet of gas; and to see that the companies come within this limit, chemists are appointed whose duty it is to analyze the gas and report its quality. I have before me the report of Dr. LETHEBY for the months of January, February, and March, 1869. He states the grains of sulphur found in 100 cubic feet of gas to be as follows:

	Maximum.	Minimum.	Average.
City of London Gas-Light and Coke Company,	18·92	11·70	15·00
The Gas-Light and Coke Company	24·15	15·75	19·49
Great Central Gas Consumers' Company.....	24·00	7·03	12·28

From this it will be seen that the gas of London, although purified by iron, does not average 20 grains of sulphur in 100 cubic feet. With regard to the Paris gas, which is purfied by LAMING'S oxide of iron mixture, Prof. J. LAWRENCE SMITH, one of the U. S. Commissioners to the French Exposition of 1867, who is the President of the Louisville gas company, has given us a very decided opinion. On page 88 of his report, which was published by the U. S. Government, he says: "The gas of these works is most thoroughly purified, and the dealers in silks and other delicate fabrics, now no longer suffer from this cause." Dr. LETHEBY (*Journal of Gas-Lighting*, 1869, p. 83) has argued that 20 grains of sulphur should not be left in the gas, and proposes, therefore, as the most effective method of purifying gas, this treatment: first, with ammoniacal liquor; second, with hydrated oxide of iron; third, with dry lime. As the iron will have removed the sulphuretted hydrogen, the refuse lime will not be offensive, while it will effectually remove the carbonic acid. This system of purification will, he thinks, reduce the quantity of sulphur to 10 or 12 grains per 100 cubic feet. Most gas engineers and chemists differ from Dr. LETHEBY on this point, however. Dr. SCHILLING says (in his *Journal für Gasbeleuchtung* for 1869, p. 484): "20 grains of sulphur in 100 cubic feet of gas are entirely unobjectionable. Under the most favorable circumstances, with no ventilation whatever, it would give the atmosphere of a room only one part of sulphurous acid in 500,000 parts." Prof. WM. ODLING, Secretary of the London Chemical Society, has spoken very clearly on this subject in his lecture to the British Association of Gas Managers, June 2, 1868, which appears in the *Journal of Gas-Lighting* for 1869, p. 81, and I have found that his views are those generally entertained by chemists and gas engineers. He said: "I am altogether at issue with the public when they maintain that the sulphur of gas produces, by its combustion, oil of vitriol, or that the amount of sulphur, ordinarily contained in gas, is of any consequence whatever; and a little consideration will, I think, satisfy you of the soundness of this position. We will assume that coal-gas contains not 20, but 40 grains of sulphur in 100 feet—a quantity at any rate greatly exceeding the reality. Now, making another extravagant assumption that the whole of these 40 grains of sulphur would be burned very incompletely—they would furnish, by their combustion, 80 grains of sulphurous acid gas. This quantity of sulphurous acid would occupy, at ordinary temperatures, about 1-15th part of a cubic foot, and since 100 cubic feet of our coal-gas gives 1-15th part of a cubic foot of sulphurous acid, 1500 cubic feet of coal-gas would be required to furnish one cubic foot of the acid, even upon the extravagant assumptions we have purposely made. But the combustion of 1500 feet of coal-gas would produce something besides sulphurous acid. It would produce at least 1000 cubic feet of carbonic acid, and, in addition to its dilution by other gases and vapors, we should have our sulphurous acid diluted by 1000 times its volume of carbonic acid. Now, if we can get at the proportion of carbonic acid in the atmosphere of a room highly illuminated with gas, and take 1-1000th part of that proportion, we shall be able to form some notion of the amount of sulphurous acid present. You will remember that the amount of carbonic acid furnished by the breath of one individual is equal to that furnished by two 3-feet gas burners, and that the maximum amount of carbonic acid found in the atmosphere of a crowded theatre was 0·32 per cent. Now, if in addition to our previous unreasonable suppositions, we further suppose that an atmosphere contains 0·2 per cent. of carbonic acid furnished by gas combustion, you will see that the whole matter becomes a *reductio ad absurdum*—that we might actually have one-half millionth part of sulphurous acid present in the air of a gas-lighted room." The facts and opinions here quoted effectually dispose of the second objection to oxide of iron purification.—*American Gas-Light Journal.*

TO BE CONTINUED.

Manufacture of White Lead.—The essential features of the invention of Mr. L. BRUMLEU, of Newcastle-on-Tyne, consist in, firstly, effecting the division of the lead to be converted into white lead, and then subjecting the same, contained in a suitably arranged chamber, to the action either of acetic acid or acetate of lead, or of mixtures of the same, and also the action of air and of carbonic acid; the chamber or chambers being so constructed that a rocking motion may be given to them, in order that the white lead formed upon the surface of the lead may be removed by the action of the solution contained therein, and a fresh surface be thereby exposed.

The New Almaden Continuous Furnace.

WE append a table showing the work of a new continuous quicksilver furnace, running since the 4th of March last, at the New Almaden mine, in Santa Clara County.

	Pounds of ore roasted.	Flasks —Quicksilver produced— Free.	From Soot.	Total.	Per centage.	Cords Wood burned.	Charcoal and Coke burned, pounds.
March..... ...	501,800	449	21	470	7.17	19½	5,866
April.	576,000	504	23	526	6.98	20¾	8,640
May.....	595,200	738	29	767	9.85	22	8,928
June	576,000	713	31	744	9.88	29½	8,740
July	593 600	810	52	862	7.31	24¼	11,904
August.....	608,000	658	41	699	8.73	22½	9,120
September	576,000	744	23	767	10.18	22¼	8,640
October	595,200	862	29	891	11.45	25	8,928
November.	576,000	1,066	46	1,112	14.76	24½	8,640

The general manager, Mr. RANDOL, who furnishes us the above figures, states that this furnace is the "champion," so far as he knows.—*Scientific Press.*

SELECTED LIST OF PATENTS.

FOR THE WEEK ENDING DEC. 18, 1875.

RELATING TO MINING, METALLURGY, GAS MAKING, ENGINEERING, &C. REPORTED FOR THE "ENGINEERING AND MINING JOURNAL" BY LOUIS BAGGER & CO., SOLICITORS OF PATENTS, WASHINGTON, D. C.

170,430. Furnaces for Heating Steel in Tempering, Jno. B. Armstrong, Guelph, Canada.—The blast pipe consists of an inner and outer tube, the former being perforated spirally, while in the outer tube the perforations are in a right line. By rotating the latter, the blast is regulated. Flues conduct the heated products of combustion around the central chamber.

170,475. Combined Scrubbers and Condensers for Illuminating Gas, Thos. C. Hopper, Philadelphia, Pa.—The wash-water enters at the top through a seal-cup, and passes down through the perforated disks and heaters, while the gas passes up. The disks and heaters are secured to a central shaft, and revolve with it.

170,479. Rock-Drilling Machines, A. Kirk, Pittsburgh, Pa.—Within the main frame is pivoted a secondary frame, the lower end of which has freedom to swing toward, and from, the rock to be drilled, and within said swinging frame is arranged a sliding frame, which carries the drilling apparatus.

170,512. Rotary Engines, Jno. Blodgett, Nashville, Tenn.—The cut-off wheel is provided with a passage which extends half-way round, and a similar passage on the other side around the other half, to change the steam alternately in the driving chambers.

170,535. Processes for Treating Ores, H. H. Eames, Oakland, Cal.—The process of treating ore pulp with the protochloride of iron, and the dichchloride or sub-chloride of copper, simultaneously in the same pan, tub, or vessel.

170,609. Blasting Cartridges, Friend W. Smith, Bridgeport, Conn.—A blasting cartridge, made of flexible material in tapering form, having an interior cup of rigid material forced down into the same.

170,625. Apparatus for Roasting Gold and Silver Ores, Robert M. Fryer, New York, N. Y., Assignor to the Fryer Noble Metal Mining Company of New York.—The fuel and quartz are fed in through the door. The heat of combustion generates steam in the jacket, which passes up, and, issuing through a circular perforated pipe in the stack, causes a draft. The metallic fumes, as they issue from the furnace, are condensed by water falling from the cone, and are collected in the upper water-jacket. The movable bottom is lowered, and carries the reduced charge to any point desired.

170,642. Ore Concentrators, James W. Pomeroy, Boulder, Colo.—Ore is delivered into a hopper, from which it is fed, upon raising the gate, upon an endless belt. This, in turn, delivers it to a series of step-like adjustable pans. The whole is mounted on standards, and receives motion from a cam upon the central shaft.

Notes.

Burning of a Colliery.—POTTSVILLE, Pa., Dec. 21.—The New Philadelphia Coal Company's colliery, at New Philadelphia, in this county, owned in New York, was burned this morning. Loss, $20,000; fully covered by insurance.

Repeal of Customs Dues in Sweden.—On and after Jan. 1st, 1876, tools, other than those named, hammers, anvils, etc., together with printing types, will be permitted free entry at any Swedish ports. The duty on needles and pins has been reduced from 8½d. to 6½d. per lb.

The "Molly Maguires" Excommunicated by the Archbishop of Philadelphia.—SHENANDOAH, Pa., Dec. 21.—At the services in the Roman Catholic Church at Mahoney Plane, the Rev. Daniel O'Connor, the pastor, read a letter from the Archbishop of Philadelphia, which was a formal excommunication of the society known as the "Molly Maguires," otherwise known as the Ancient Order of Hibernians.

Nickelising the Mariner's Compass.—To preserve the steel parts of the compass from rust, M. DUCHEMIN covers them with a coating of nickel, finding that silver or gold plating offers a certain resistance to the passage of the magnetic current. An experimental compass was made by him, some of the rings of which were nickelised, and others left unprotected. The compass was then placed on board the frigate *La Creuse*, which went round the world, and brought home the compass in the condition predicted for it, the unprotected rings being rusted, the protected ones perfect. The process used in the electro-deposition of the nickel is that described by Messrs. BECQUEREL in 1862.

Spontaneous Combustion of Coal on board Ship.—There has lately been a considerable increase in the number of cases of fire arising from this cause. From statistics, collected by Mr. R. C. RUNDELL, and given by him in a report to the Underwriters' Association of Liverpool, it appears that, taking the number of vessels carrying upwards of 500 tons of coal which have sailed from the United Kingdom for ports south of the equator, during the first nine months of the years 1873 and 1874, the number of casualties from spontaneous combustion was 23, or about 2 per cent. of the total number of vessels in 1873; and 50, or about 4 per cent., in 1874. The statistics further show that the fires are not confined to one kind of coal, but have occurred in most, if not all kinds, exported from all parts of the United Kingdom.

Mechanical Puddling.—According to the invention of Mr. F. W. STOKER, of Moor Ironworks, Stocton-on-Tees, a framing above the puddling furnace carries a vibrating table turning on a vertical axis, to which brackets carrying the upper ends of the suspension rods for the rables are fixed. A horizontal shaft carried by the framing has at one end a chain sheave or gearing by which rotary motion is imparted to it, and at the other end, immediately over the centre of the vibrating table, it has a crank connected by a universal joint to connecting rods that actuate the one before-mentioned suspension rods of the rabbles. The horizontal table is vibrated by a worm on the horizontal shaft, in gear with which is a worm wheel on the upper end of a vertical shaft the lower end of which carries a crank that acts on a lever projecting from the axis of the table, and thus imparts a vibrating motion to the latter.

New Quicksilver Furnace.—Something new in quicksilver reduction has been invented by Mr. LIVERMORE, of the Redington mine, which consists of greatly improved furnaces constructed to burn the finer ores, or screenings, which, heretofore, have been made into adobes, at a cost of over one dollar per ton. These furnaces are simple and cheap in construction, requiring no engine or other machinery to run them. The ore is fed into a hopper, on top, and drawn out at the bottom, perfectly burned. One of these furnaces reduces 20 tons, and the other 24 tons of ore every twenty-four hours, each consuming about one cord of wood during that time. They will prove of incalculable benefit to this and adjoining counties in enabling our mine-owners to profitably work large lots of fine ores, heretofore left as worthless. The saving to this company in fuel, expense of blower and making adobes, will be, at least, ten thousand dollars a year on each furnace. The Redington mine produced, last month, over one thousand flasks of quicksilver.—*Napa Reporter.*

Decline in Coal Miners' Wages in Great Britain.—The Chief of the Bureau of Statistics desires us to state that he has just received information from WALTER ROWLEY, ESQ., Mining Engineer, showing that the following reductions in coal miners' wages have been made since the statement published in his Report on Labor in Europe, viz.:

Glasgow, all off—making wages now same as in										1871
West Yorkshire, 22½ per cent., or			making wages 35 per cent. above							"
Monmouth and S. Wales, 3 per cent. or			"	"	16	"	"	"		"
Somerset,	14	"	"	"	"	22	"	"	"	"
Durham,	7	"	"	"	"	23	"	"	"	"
South Yorkshire,	10	"	"	"	"	27½	"	"	"	"
Cumberland,	13	"	"	"	"	18	"	"	"	"
Northumberland,	10	"	"	"	"	16	"	"	"	"
Dean Forest,	10	"	"	"	"	15	"	"	"	"

Copper Production of Lake Superior Mines, 1875.—Below will be found the official statement of ingot copper and mineral shipped from this port during the season of navigation just ended:

REFINED COPPER.

	Tons.	Lb.
Calumet and Hecla	10,348	1022
Osceola	489	994
Allouez	420	112
Pewabic	150	..
Franklin	349	1130
Atlantic	120	1754
Isle Royale Tribute Co	53	1944
Houghton Tribute Co	25	631
Hancock Tribute Co	14	229
Tribute Co	9	1896
Houghton Mining Co	6	658
Central	2	555
Osceola Tribute Co	1	1624
Philip Scheuermann	..	440
Total refined copper	11,992	989

MINERAL COPPER.

	Tons.	Lb.
Calumet and Hecla	410	1780
Osceola	21	590
Allouez	31	920
Pewabic	13	840
Franklin	20	900
Sampson Tribute Co	8	1056
Total mineral copper	506	86

Portage Lake Mining Gazette.

Escanaba Iron and Ore Shipments.—Mr. H. A. BARR, agent for the Northwestern Railway Company, at Escanaba, has kindly furnished us with the following comparative statement of ore shipments from Escanaba for the years 1874 and 1875:

YEAR AND MANNER OF SHIPMENT.	Shipments.	Decrease.	Increase.
Total shipments ore by lake in 1874	298,498	.....	.....
Total shipments ore by lake in 1875	264,084	34,414	.....
Total shipments ore by rail in 1875	35,743	.....	.....
Total shipments ore by rail in 1874	22,554	.....	13,189
Total shipments pig iron by lake, 1875	15,840	.....	.....
Total shipments pig iron by lake, 1874	14,773	.....	1,067
Total shipments pig iron by rail, 1874	4,144	.....	.....
Total shipments pig iron by rail, 1875	1,064	3,080	.....
Total shipments quartz by lake, 1875	2,390	.....	.....
Total shipments quartz by lake, 1874	954	.....	1,436
Total	.....	37,494	15,692

Total tonnage for season of 1874 ..... 340,923 tons.
Total tonnage for season of 1875 ..... 319,121 "

Actual decrease in 1875 ..... 21,802 "

Marquette (Mich.) *Mining Journal.*

Total Shipment of Iron, by Lake, from the Lake Superior Region during 1874 and 1875.—The shipping season having closed, we omit our usual tables, except the summary, comparing the shipments of 1775 with those of the year previous, which is as follows:

IRON ORE.	1874.	1875.
From Marquette	439,942	459,425
From Escanaba	290,301	263,944
From L'Anse	87,498	70,003
Total	817,741	793,372
PIG IRON.		
From Marquette	29,515	30,608
From Escanaba	14 773	17,085
From Grand Island	13,679	13,341
Total	57,967	61,034
Total ore and pig metal	875,708	834,406

Showing a decrease of 41,302 tons. It must be remembered, however, that the above figures represent the lake shipments only, and do not show the total production of the mines in either year.—Marquette *Mining Journal.*

STATISTICS OF COAL PRODUCTION.

Duties.

Anthracite free, *Bituminous*, per ton of 28 bushels, 80 lb. to the bushel, 75c., gold.

All *slack*, or *culm*, such as will pass through a half-inch screen, per ton of 28 bushels, 80 lb. per bushel, 40c. gold.

Not otherwise provided for, per ton, 40c. gold.

This is the only Report published that gives full and accurate returns of the production of our Anthracite mines.

Comparative Statement for the week ending Dec. 18.

	1875.		1874.	
	Week.	Year.*	Week.	Year.
Wyoming Region.				
D. and H. Canal Co	58,820	2,952,300	51,484	2,326,278
D. L. and W. RR. Co	41,349	3,203,725	39,707	2,432,428
Penn. Coal Co	25,478	1,327,315	21,524	1,294,347
L. V. RR. Co	13,888	909,469	19,152	921,493
P. and N. Y. RR. Co	672	87,243	....	57,596
C. RR. of N. J	50,089	1,461,159	36,124	1,486,020
Penn. Canal	..	297,500	..	321,374
Lack. and B. RR	..	81,493	..	112 529
	190,296	10,320,204	167,988	8,955,065
Lehigh Region.				
L. V. RR. Co	66,619	2,196,718	57 650	3,117,524
C. RR. of N. J	29,632	803,810	24,801	1,164.018
D. H. and W. B. RR	1,411	80,039	645	40,654
	97,682	3,080,567	83,096	4,327,196
Schuylkill Region.				
P. and R. R. RR. Co	99,378	4,732,785	86,609	5,258,318
Shamokin & Lykens Val.	6,172	1,178,168	5,841	895,868
	105,550	5,910,953	92,450	6,154,186
Sullivan Region.				
Sul. and Erie RR. Co	1,279	13,794	577	33,384
Total	394,807	19,325,518	344,111	19,464 831
Increase	50,696	..	..	..
Decrease	..	139.313	..	..

* Year beginning January 1st.

The above table does not include the amount of coal consumed and sold at the mines, which is about seven per cent. of the whole production.

The following Table does not give the entire production of our Bituminous mines, but it is by far the fullest report published.

The Production of Bituminous Coal for the week ending Dec. 18, was as follows:

Tons of 2,000 lb., except where otherwise designated.

	Week.	Tons.	Year.	Tons.
Cumberland Region, Md.				
Tons of 2,240 lb		24,440		2,251,131
Barclay Region, Pa.				
Barclay RR., tons of 2240 lb		8,309		331,034
Broad Top Region, Pa.				
Huntingdon and Broad Top RR		3,005		206,838
*East Broad Top		1,709		48,781
Clearfield Region, Pa.				
*Snow Shoe		844		58,339
*Tyrone and Clearfield		23,691		853,404
Allegheny Region, Pa.				
*Pennsylvania RR		4,934		207,180
Pittsburgh Region, Pa.				
*West Penn. RR		4,797		208,533
*Southwest Penn. RR		1,145		24,647
*Penn. & Westmoreland gas coal, Pa. RR.		15,935		677,501
*Pennsylvania RR		7,211		404,546
Kanawha Region, W. Va.				
†Chesapeake and Ohio RR		5,741		166,517

* To Dec. 7. † Nov. 20.

The Production of Coke for the week ending Dec. 7.

Tons of 2000 lb.	Week. Tons.	Year. Tons.
Tyrone and Clearfield	..	285
Alleghany Region	..	58
West Penn. RR	944	48,169
Southwest Penn. RR	9,842	511,710
Penn. & Westmoreland Region, Penn. RR.	793	33,820
Pittsburgh, Penn. RR	3,840	108,545
Total	15,419	702,587

The receipts at Port Richmond for the week were 12,500 tons, shipments 14,500 tons, and balance on hand 167,000 tons.

The decrease of shipments of Cumberland Coal over the Cumberland Branch, and Cumberland and Pennsylvania Railroads amounts to 55,364 tons.

The Receipts at Perth Amboy for the week were 16,612 tons, shipments 7,902 tons, and balance on hand 71,509 tons.

The Exports of Coal from Baltimore for the week were 198 tons, and for the year, 36,746 tons as compared with 66,819 tons to the corresponding time in 1874.

Receipts of Coal at Boston, for week ending Dec. 27, and years from September 1st, 1874 and 1875.

From	Week. Tons.	Previously. 1875. Tons.	1874. Tons.
Alexandria and Georgetown	1,646	42,671	43,652
Philadelphia	12,203	282,868	222,084
Baltimore	1,878	49,106	59,059
Other places	2,126	118,959	93,472
Great Britain	—	704	1,363
Nova Scotia	—	11,868	13.469

Shipments from Pictou, N. S., for the week ending Dec. 4:

	Tons. Week.	Year.
To United States	—	28,121
" West Indies	—	3,971
" South America	—	4,772
" Canada	—	140 878
" Other Provinces	1,300	67.714
	1,300	245,456

Belvidere Delaware RR. report:	Week.	Year 1875.	Year 1874.
Receipts of coal at Coal Port (Trenton)	4 936	198,390	267,083
" " " South Amboy	13,350	280,077	614,784
Shipments of Coal Port (Trenton)	2,631	195,362	267,884
" South Amboy	3.165	330,121	607,385

Shipments from Block House, Cow Bay, C. B., to the following destinations, from Nov. 8 to Nov. 29, 1875:

	Week.	Year.
Provinces	414	7,774
West Indies	—	1,393
United States	—	11,039
	414	20,206

COAL TRADE REVIEW.

NEW YORK, Friday Evening, Dec. 24, 1875.

Anthracite.

The mild weather of the past few days has tended to increase the dullness which was already great. Prices are fully as irregular as they were a week ago. It is rumored that some of the companies are anticipating the opening prices of next season and are offering coal, through outside parties, at a large reduction from the present circular rates. To attempt to maintain circular prices, with the large amount of coal now offering at lower rates, is to confine the business of a company to supplying only special necessities, so that we are surprised to see any company attempting it.

Price circulars have been issued for January, but in no case do they differ from those issued for this month

The Production of anthracite coal for the week ending December 18, was 394,807 tons, and from January 1, 19,325,518 tons. The production of the corresponding week of 1874 was 344,111 tons, and from January 1, 1874, 19,464,831 tons. From the above figures it will be seen that there was an increase in the production of last week, as compared with the corresponding week of 1874, of 50,696 tons. There has been a decrease since January 1, as compared with the corresponding period of 1874, of 139,313 tons.

Bituminous.

There is but a very limited business doing in Bituminous Coals, at prices the same as have ruled for weeks. The shipments from the Cumberland field, as is usual at this season of the year, have dwindled to less than one-

half their usual proportions, and are less than a year ago. Our last reports of shipments from Central Pennsylvania, however, show very favorably, and are but little below the largest of the year. One cause for this is the very low price at which these coals are being sold. We are reported sales of Clearfield coal at Philadelphia, for shipment, at $3 90 per ton.

Foreign and Gas Coals.—In ordinary gas coals there is but very little if anything doing. There is, however, some movement in cannel coals. The arrivals of foreign coals are small and all upon orders. There is but little foreign coal to arrive.

Freights.

There is but little inquiry for vessels. Rates of freight are nominally unchanged.

Wholesale Prices of Anthracite Coal for Dec. f.o.b. at the Tide Water Shipping Ports per ton of 2240 lb.

	Lump.	Steamer.	Grate.	Egg.	Stove.	Chestnut.
Wyoming Coals.						
*Lackawanna and Scranton at Rondout and Hoboken	5 05	5 15	5 25	5 65	6 10	4 95
¶Pittston at Newburgh	5 05	5 15	5 25	5 65	6 10	4 95
Wilkesbarre at Port Johnston	5 05	5 15	5 25	5 65	6 10	4 95
Plymouth, R. A., *Net*	....	....	5 25	5 65	6 10	4 95
Susque. Coal Co. at Amboy W.A.	5 05	5 15	5 25	5 65	6 10	4 95
Kingston at Hoboken	5 05	5 15	5 25	5 65	6 10	4 95
Lehigh Coals.						
Old Company at Port Johnston	5 55	....	5 55	5 65	6 10	5 10
Old Company's Room Run "	5 55	....	5 55	5 65	6 10	5 10
§Sugar Loaf, Hobok. & Amb. "	5 55	....	5 55	5 65	6 10	5 10
Lehigh Coal Exchange "	5 55	....	5 55	5 65	6 10	5 10
Honey Brook Lehigh	5 55	....	5 55	5 65	6 10	5 10
Spring Mt. C. Co. at Hoboken	....	....	....	....	....	....
Beaver Meadow at South Amboy	5 55	....	5 55	5 65	6 10	5 10
†Schuylkill Coals at Port Richmond.						
Schuylkill white ash	4 55	4 65	4 75	5 15	5 60	4 45
Schuylkill red ash	....	....	5 05	5 25	5 65	4 45
Shamokin white and red ash	....	....	....	5 40	5 80	4 50
Lorberry	....	....	5 90	5 90	5 90	4 65
Lykens Valley	....	....	6 50	6 50	6 50	5 50

Per ton.

Freight from Hoboken and Weehawken to New York .... 40c.
" " Elizabethport & Port Johnston to N. York. 45o.
" " South Amboy to New York ..... 50c.

*Freight on Lackawanna coal from Rondout to New York, by boats or barges of the D. and H. Canal Co. 50c. per ton, the expense of towing vessels from New York harbor to Rondout and back will be borne by the Company.

† Freight from Port Richmond to New York (free of discharging) 85c. per ton.

‡ Prices to the Trade.

§ By Canal at New York, Jersey City and Brooklyn, 30c additional alongside.

¶ Schuylkill coal is delivered f.o.b. of boats in New York harbor at 5c. per ton additional to these rates.

‖ These rates are nominal.

Wholesale Prices of Bituminous Coal.

Domestic Gas Coals.

Per ton of 2240 lb.	At the Shipping Ports.	Alongside in New York.
Westmoreland and Penn. at Greenwich, Philadelphia	$5 20	$6 50
" " at S. Amboy	6 00	6 50
Red Bank Cannel Pa. at Philadelphia	8 00	8 50
" " South Amboy	8 50	..
" Orrel	6 00	6 50
Youghiogheny, Waverly Co., at Balt	5 00	6 50
Despard, West Va.,	5 00	6 50
Murphy Run, West Va., at Baltimore	4 75	6 50
Fairmount, West Va,, " "	4 75	6 50
Newburgh Orrel, Md. " "	4 75	6 50
Cannelton Cannel, W. Va., at Richmond,	9 50	11 00
" Splint, " "	5 00	6 50
Peytona Cannel, "	9 50	11 00
Straitsville " at Sandusky, O	3 25	10 00

Foreign Gas Coals.

	Sterling.	Am. cur'cy.
Newcastle, at Newcastle-on-Tyne	10/6@12/9	6 50@7 00
Liverpool House Orrel, at Liverpool	26/	13 00
Ince Hall Cannel "	47/	18 00@20 00
" Gas Cannel "	32/6d	13@14
Scotch Gas Cannel, at Glasgow, nominal,	24/ Gold.	7 50
Block House, at Cow Bay, N. S	2 00	5 50
Caledonia, at Port Caledonia	1 75	5 25
Glace Bay, at Glace Bay	1 60	5 50
Lingan, at Lingan Bay	1 75	....
Sydney, International and Reserve mines, at Sydney	2 00	5 50
Pictou, Albion & Vale mines, at Pictou.	2 25	5 75

Steam and House Coals.

Broad Top, at the mine, $1 25; at Amboy	4 75@5 00	5 25@5 50
Cumberland, at Georgetown and Alexandria, Va	4 00@4 25	5 25@5 50
Cumberland, at Baltimore	4 25@4 35	5 75@6 00
Clearfield and Allegheny, "Kittanning," "Sterling," "Sonman," and "Eureka," at the mines, 90 ; at Greenwich, Phil	4 25	5 65

Retail Prices in New York.

Anthracite.

Per 2000 lb.	Grate and Egg.	Stove.	Chestnut
Pittston coal, in yard	$5 70	$6 00	$5 30
Lackawanna coal, delivered	6 75	7 00	6 25
Wilkes-Barre, "	7 00	7 25	6 50
Lehigh & Locust Mountain, del'd.	7 25	7 50	6 75
Schuylkill Red Ash, del'd	7 00	7 50	

The Cost of delivering Pittston coal ranges from 40 cts. to $1 per ton, according to distance from the yard,

Williamsburgh, N. Y.

Lackawanna Coal delivered.

Stove	$7 00
Egg	6 50
Chestnut	6 00

Egg and chestnut, sizes of the Old Company's Lehigh coal is 25c. per ton more than the above rates.

Bituminous.

Liverpool House Orrel, delivered, per ton of 2000 lb	$23 00
Liverpool House Cannel " " "	25 00
American " " " "	15 00
Kanawha splint, " " "	15 00
American Orrel " " "	11 00
Red Bank Cannel " " "	14 00
Cumberland " " "	7 00

Baltimore, Md. Dec. 21, 1875.

Reported by our Special Correspondent.

ANTHRACITE.

Wholesale or Trade Prices per 2240 lb.

	In cars at depot.	By boats afloat.
Wilkes-Barre "Lee" or "Diamond," Pittston and Plymouth, White ash.		
Lump and steamboat	$4 80	$4 65
Broken	5 55	5 40
Egg	5 92	5 77
Stove	6 17	6 02
Nut	4 97	5 10
Shamokin, (red or white ash), and "Boston," freeburning white ash,		
Egg	5 95	5 79
Stove	6 15	5 99
Lykens Valley, red ash,		
All sizes	6 55	6 37

From wharf or yard, wholesale, 50@75c. additional. By retail, all kinds and sizes, per 2240 lb. $7 00@8 00.

BITUMINOUS.

George's Creek and Cumberland f. o. b. at Locust Point	4 15 / 4 50
West Virginia f. o. b. at Locust Point	5 50
Youghiogheny Gas, f. o. b. at Locust Point	5 50
Swanton Coal, George's Creek	4 40

Boston. Dec. 21, 1875.

Reported by our Special Correspondent.

CARGO PRICES TO TRADE.

Lingan coal	$5 20	Westmoreland and Penn.	6 85
Caledonia	5 00	Waverly Co. Youghiogh'y.	6 80
Pictou	5 60	Cannelton Cannel	11 60
Block House	5 20	Cumberland	5 80@6 00
Red Bank Cannel	9 00	Anthracite .6 50@7 25	
Glace Bay	5 00	" retail..7 50@8 00	
Sydney	6 25		

Buffalo, N. Y. Dec. 20, 1675.

Reported by our Special Correspondent.

ANTHRACITE.

	Afloat f.o.b.	Retail, Deliv'd.
Grate	$6 40	$7 40
Egg	6 40	7 40
Stove	6 85	7 85
Nut	6 60	7 60

BITUMINOUS.

	Lump.	Run of Mine.	Nut.	Slack.	Nut & Slack.
Connellsville Coke	$5 25	....	....	....	....
Brookfield Coal	....	....	....	....	....
Briar Hill	4 50	....	....	....	3 00
Youghiogheny	4 75	....	....	....	....
Monterey	3 75	3 50	3 25	2 50	....
Catfish	3 75	3 50	3 25	2 50	....
Stoneboro	....	....	3 25	2 50	....
Sterling Cannel	5 50	....	....	....	....
Buffalo Coal Co	3 50	3 25	....	2 30	....
Cameron	....	3 25	....	....	....

Chicago, Ill. Dec. 21, 1875.

Specially reported by Messrs. RENO & LITTLE, Coal Merchants. Retail prices per ton of 2000 lb. delivered to buyer.

No change in prices of coal. Weather mild. Trade very quiet.

Lehigh Lump	$10 50	Briar Hill and Erie	@ 7 00
Lehigh grate and egg	10 50	Walnut Hill, Pa	@ 6 50
Lehigh stove and chest	11 00	Midway, Pa	@ 6 50
Lackawanna, Wilkes Barre and Pittston*		Cannel	@ 8 00
		Blossburg	7 50
Grate and egg	9 50	Indiana Block	6 00
Stove and chestnut	10 00	Hocking "Brooks"	6 50
		Wilmington and Illinois	5 00

BITUMINOUS.

* 50 cents off these prices for car load lots to country dealers and manufacturers.

Cincinnati, O. Dec. 20, 1875.

Reported by our Special Correspondents.

Owing to the late runs of coal from Pittsburgh, the prices of all kinds of soft coal have declined. The following are the quotations:

Per ton of 2000 lb.	Bush.	Ton.
Youghiogheny, or Pittsburgh, afloat	9 c.	——
Pomeroy coal	6 c.	——
Kanawha "	10 c.	——
Cannel coal, according to quality	16 c.	——
Semi-Cannel	7½c.	——

The following are the retail prices delivered

Youghiogheny —c.	$3 50
Semi-Cannel —c.	3 50
Pomeroy 11c.	2 75
Cannel —c.	6 00
Kanawha Semi-Cannel 13c.	3 60
Anthracite	10 00@11 00
Foundry coke 10c.	——
Coke, hard and soft 12c.	....

Cleveland, O. Dec. 21, 1875.

Specially reported by Messrs. WARNER, BATES & CO.

WHOLESALE.

Per ton of 2000 lb. f. o. b. vessels.

	For vessels,	On cars.
Youghiogheny Gas Coal	$4 40	$4 15
Cannel	4 50	4 15
Blossburgh	5 00	5 00
Briar Hill, Block Coal	3 80	3 60
Hocking Valley	3 25	3 10
Straitsville Coal Co., lower vein	3 25	3 10
Massillon	3 10	3 30
Tuscarawas Valley	2 85	2 70
Columbiana	2 80	2 60

RETAIL DELIVERED.

	Lump.	Nut.
Briar Hill	$5 00	$3 50
Massillon	4 50	4 00
Mineral Ridge	4 50	4 00
Columbiana	3 25	3 00
Straitsville Coal Co., lower vein	4 00	3 00
Tuscarawas Valley	3 25	3 00

ANTHRACITE DELIVERED.

	Grate.	Egg.	Stove.	Chestnut.
Lehigh	$9 00	$9 00	$9 50	$9 25
Wilkes-Barre	8 10	8 10	8 50	8 25
Lackawanna	8 10	8 10	8 50	8 25

Detroit, Mich. Dec. 21, 1875.

Specially reported by Messrs. ROBINSON & KEYS, Dealers in all kinds of coal.

Per ton of 2000 lb.

Lehigh Lump, per ton	$10 50	Blossburg	8 50
Lehigh " prep. sizes	10 00	Briar Hill	7 50
Wilkes-Barre, Grate and Egg	9 00	Willow Bank	7 00
Wilkes-Barre, Stove and Nut	9 50	Erie	7 00
		Massillon	7 00

Erie, Pa. Dec. 21, 1875.

Reported by our Special Correspondent.

Wholesale, per ton of 2000 lb. Bituminous f. o. b.

Briar Hill lump	$3 75	Beaver lump	$3 50
Midway	3 25	Cat Fish	3 00

Indianapolis, Ind. Dec. 21, 1875.

Specially reported by Messrs. COBB & BRANHAM

We quote coal in our market as follows:

Wholesale on board cars, and retail delivered to consumers. Per ton of 2000 lb., bushel of 70 lb.

BITUMINOUS.

Indian Creek, per ton	$2 75	Peytona cannel, per ton.	7 00
White River, "	2 75	Indiana Cannel	6 50
Brazil Block, "	2 90	Hocking Valley	4 25
Highland, grate, "	2 50	Youghiogheny	4 75
Block coal, nut, per car	18 00	Blossburg (smithing)	6 50
Highland " "	18 00	Piedmont "	6 50
Block Slack "	17 00	Gas coke, per bushel	10

ANTHRACITE (Lackawanna and Wilkes-Barre.)

Broken	$8 70	Nut	8 75
Egg	8 70	Stove	9 00

Lehigh Anthracite.

Broken	10 35	Nut	10 35
Egg	10 35	Stove	10 00

Retail, per bushel, delivered.

Sand Creek	16c.	Block Nut, steam	9
White River	14	" Slack, "	8
Brazil Block	15	Peytona Cannel	28
Highland grate	13	Virginia "	27
Block Nut, domestic use	12	Youghiogheny	22
Highland Nut, "	12	Blossburg	26
" " steam	9	Piedmont	26

GAS COKE (measured.)

Crushed	15c.	Lump	12c.

ANTHRACITE.

Wilkes-Barre and Lackawanna (all sizes)	$9 75 per ton.
Lehigh, retail	$11 50 per ton.

Louisville, Ky. Dec. 21, 1875.

Specially reported by Messrs. BYRNE & SPEED.

WHOLESALE.

	per bushel		per bushel
Pittsburgh	10c	Pine Hill	—
Raymond City	9c.	Kentucky	—

RETAIL.

	per bushel		per bushel
Pittsburgh	14c.	Peytona Cannel	20@22c.
Raymond City	13c.	Buckeye "	—
Pine Hill	13c.	City-made Coke	11c.
Kentucky	12c.	Anth., per ton,	$10 00 to 10 50
Screened Pittsburgh per load			$3 00
Screened Raymond City			2 75
Pine Hill (Kentucky)			2 75
Cannel			$5 to 5 50

Milwaukee, Wis. Dec. 21, 1875.

Specially reported by Messrs. R. P. ELMORE & Co.

Retail price per ton of 2000 lb.

Lehigh Lump	$10 00	Briar Hill, select	$8 00
Lehigh Prepared	11 00	Blossburgh	8 00
Lackawanna (all sizes)	10 00	Cannel	8 00
Pittston	10 00	Pittsburgh	7 00
Scranton	10 00	Steam coal	5 00

New Orleans, La. Dec. 19, 1875.

Specially reported by Messrs. P. & R. DE VERGES, Wholesale and Retail Dealers in Pittsburgh, Anthracite, Cannel and other Coals.

Pittsburgh coal, retail, per bbl	60c.
" wholesale	35c.
" steamboats, per box	50c.
" to manufacturers, per bbl	55c.
" shipments, per hhd	$6 00
Anthracite, wholesale, per ton	9 50
" retail, "	12 50
Virginia Cannel, per bbl	80c.
Scotch " "	....
Mt. Carbon, wholesale, per bbl	....
" " retail, "	....
St. Bernard, wholesale, per bbl	....
" retail, "	....

Richmond, Va. Dec. 19, 1875.

Specially reported by S. H. HAWES, Dealer in Coal.

Per ton of 2240 lb., f.o.b.

Kanawha Cannel	$12 00	New River Bituminous,	$4 50
" semi-Cannel	4 75	Clover Hill Coal	4 25
Coalburgh Splint	4 75	James River Bitum	3 30
Lewiston "	4 75	" " Carbonite,	5 80
Kanawha Gas coal	4 50		

Toledo, Ohio. Dec. 21, 1875.

Specially reported by Messrs. GOSLINE & BARBOUR.

Per ton of 2000 lb. on cars.

Hocking Valley	$3 40	Massillon	4 00
Straitsville	3 40	Youghiogheny	5 00
Shawnee	3 40	Blossburg	7 00@7 50
" nut	2 90	Cumberland	7 00@7 50
Briar Hill	5 50	Connellsville coke	7 00

ANTHRACITE.

Grate, screened	$7 50	Stove, screened	$7 75
Egg, "	7 50	Chestnut "	7 50
Lehigh Lump	9 00		

40 cents to $1 per ton additional for delivery at retail.

Toronto, Ont. Dec. 18, 1875.

The following are present retail prices for coal: Per ton all sizes.

Lackawanna and Scranton	$7 00
Lehigh Lump and prepared	8 00
Blossburgh	6 50
Soft lump for grates	6 00
Soft nut	4 50

Halifax, N. S. Dec. 18, 1875.

Prices per ton of 2240 lb. in gold.

Sydney (old mines)	$4 00	Little Glace Bay	3 35
Gowrie	3 35	Blockhouse	3 35
Victoria	—	Albion (at Railroad)	4 00

Montreal. Dec. 18, 1875.

Specially reported by Messrs. ROBERT C. ADAMS & Co.

Wholesale per ton of 2240 lb.

Scotch Steam	$6 00	Cape Breton Steam	$5 25
Pictou "	5 75	Newcastle Smiths	7 00

Anthracite at retail, per 2000 lb., delivered.

Egg	$8 50	Chestnut	8 25
Stove	9 00		

Rates of Transportation on Anthracite Coal to Tide Ports.

Lehigh and Wyoming Coals. per ton of 2240 lb.	From Penn Haven.	From Mauch Chunk.	From Hazleton**	From Upper Lehigh.	From Ashley and Sugar Notch.
To ‡ Newark, N. J., via Central Railroad of New Jersey	2 60	2 46	2 93	2 93	3 16
‡ Mauch Chunk, Pa., via Central Railroad of N. J.	14	..	56	47	71
‡ Phillipsburg, N. J.	99	85	1 32	1 32	1 65
Elizabethp't, Port Johnston, Hoboken and South Amboy, N. J., shipping and wharfage 35c. add.	2 24	2 10	2 59	2 57	2 80
High Bridge, N. J.	2 40	1 95	2 80	2 54	2 72
Somerville and Raritan, N. J.	2 80	2 35	3 20	2 35	3 12
Elizabeth, Cranford, Westfield & Elizabethport, for consumption.	2 60	2 46	2 95	2 93	3 16
¶ Jersey City, N. J., and New York, via L. V. RR. and Morris Canal.	2 85	2 40	3 17	3 24	3 54
Andover, via Delaware, Lackawanna and Western RR.	3 30	3 10	3 70	3 69	3 99
Trenton ,Somerset Junction and Greensburg, via P. RR. Belvidere Division	2 65	2 45	3 05	3 04	3 34
Trenton, for shipment, including shipping and wharfage	2 11	1 95	2 45	2 46	2 76
From *Mauch Chunk* to *New York* (towing limits) and Jersey City† via Lehigh Valley RR. and Morris Canal	$2 37				
From *Mauch Chunk* to *Philadelphia* via L. V. RR. and North Penn. RR	1 75				
††From *Phillipsburg, N. J.* to *Hoboken* for shipment via Delaware. Lackawanna and Western RR., Morris and Essex Division	1 24				
From *Lackawanna Junction* to **Auburn, N. Y.*, for shipment, via Southern Central R R. in connection with Pa. and N. Y. R.R.	2 53				
From *Lackawanna Junction* to ‖*Weedsport* for *Rochester and Charlotte*	2 59				
From *Lackawanno Junction* to *Sterling* for *Oswego, N. Y.*	2 62				
‖ To this point for all places between Rochester and Buffalo the rate is	2 53				
* The rate to this point for Syracuse is	2 03				

** Rates on line coal from Hazleton are 10c. per ton above these figures.

‡ The cost of unloading is to be added to these rates. No charge less than 40c. per ton will be made for any distance. Tolls from Mauch Chunk to Phillipsburg for way points will be $1 15 per ton.

§ Twenty cents per ton less when five cars at a time to one party. Provided that where the reduction makes the rate $1 a ton, or less, the rate will be $1.

¶ 20 cents per ton additional for transferring coal from boat to boat, and 30 cents per ton for reshipment of same from wharves.

† Transportation on Coal destined for re shipment from this point is 20c. less than above rate.

†† The rate for consumption to this point is $1 80.

Schuylkill Coals. per ton of 2240 lb.	From Pine Grove	From Tamaqua.	From Port Carbon.	From Mount Carbon.	From Schuylkill Haven.
To *Port Richmond*, for shipment, via P. & R. R. R., Main Line	2 12	2 07	2 00	1 99	1 92
Philadelphia, Retail yards	2 22	2 17	2 10	2 09	2 02
Harrisburg, via Lebanon Valley Branch	1 35	2 02	1 95	1 94	1 87
Allentown, via East Pennsylvania Branch	1 70	1 65	1 58	1 57	1 50
Lancaster, and Points on Lancaster Branch, via R. & C. R.R.	1 82	1 77	1 70	1 69	1 62
Dauphin, via Schuylkill and Susquehanna Branch	85	....	1 43	1 42	1 35
Slatedale Junction via Berks and Lehigh Branch	1 88	1 83	1 76	1 75	1 68
Lebanon, via Lebanon and Tremont Branch	96	....	....	....	....
From *Tamanend* to *Catawissa*, via Catawissa and Williamsport Branch Railroad	94				
From *Tamanend* to *Williamsport*, via Catawissa and Williamsport Branch Railroad	1 39				
* From *Port Clinton* to *Philadelphia* via Schuylkill Canal, including freight and charges for the use of cars and barges, and for tolls (exclusive of cost of unloading)	1 69				
* From *Port Clinton* to *New York*, within towing limits, " 53d street	2 71				

For shipment via Main Road or Schuylkill Canal, one and one-half cents per ton per mile, and two cents per ton additional, to Port Carbon, Mount Carbon, Schuylkill Haven, Pine Grove, Tamaqua, or Port Clinton, for Canal, as the case may be.

Coal sent to points on the Catawissa and Williamsport Branch will be charged one and one-half cent per ton per mile, and two cents per ton additional to Tamanend.

The rates of freight and tolls on lump and steamboat coal (except that sent to Richmond for shipment) will be twenty per cent., and on broken coal will be ten per cent. less than the above rates.

* The charge from Schuylkill Haven to Philadelphia or New York is 11c. additional to these rates.

On and after July 5th, the Drawback of ten cents per ton now paid on shipments of Anthracite Coal from Schuylkill Haven and Port Clinton, that have passed Fairmount Locks to Philadelphia and vicinity, will be discontinued.

CANAL TOLLS, exclusive of towage, Bordentown to New Brunswick, when towed by the Company's Steam Tugs:

For Anthracite Coal..... 5½c.
Bituminous and Semi-bituminous Coal... 3½c.

Freights.

Per ton of 2240 lb.

Representing the latest actual charters up to Dec. 23, 1875.

PORTS.	From Philadelphia.	From Baltimore.	From Georgetown.	From Elizabethport, Port Johnson, South Amboy, Hoboken and Weehawken.¶
Augusta, Me.	....	2 40	....	....
Albany	*85	1 70	....	....
Amesbury, Mass.	....	....	....	....
Bangor, Me.	†2 00	3 00	....	2 10
Bath, Me.	1 60	2 75	2 90	1 30
Baltimore	....	....	....	....
Boston, Mass	§2 00	2 50	2 50	1 90@$2
Bridgeport, Ct	*85	1 75	2 00	90
Bristol, R. I.	....	....	2 00	90
Cambridgeport, Mass.	§1 90	....	2 70	2 00
Derby	....	1 65	....	....
Dighton	....	1 70	....	....
East Cambridge	1 90§	....	2 75	§1 55
Fall River	1 50	1 75	....	90
Hackensack	....	....	....	....
Hallowell, Me.	....	....	....	....
Hartford	....	1 65	....	....
Hoboken	†85	1 40	1 60	40
Hudson	....	1 65	....	....
Jersey City	....	1 40	1 60	40
Lynn, Mass	†2 10	....	....	†2 05
Middletown	....	....	....	1 25
Mystic	....	....	....	....
Newark	....	....	....	....
New Bedford	1 10	1 85	2 10	90
Newburyport	2 10	2 75	2 75	2 10
New Haven	*85	1 75	2 00	1 85
New London	1 50	1 75	2 00	1 00
Newport	1 50	1 65	2 00	90
New York	85††	‖1 75	1 70	40
Norfolk, Va.	85	60	60	....
Norwalk	85†	1 50	2 00	80
Norwich	1 50†	1 70	....	90
Pawtucket	1 75†	1 65	2 10	....
Philadelphia	....	80	....	....
Portland	1 95	2 50	2 70	1 60
Portsmouth, N. H.	2 05@2 10	2 75	2 90	2 10
Providence	1 50	1 75	2 00	1 00
Petersburg, Va	....	90	....	....
Portsmouth, Va.	....	....	....	....
Poughkeepsie, N. Y.	....	1 50	....	....
Richmond, Va.	1 00	70	....	....
Rockport	....	....	....	....
Saco	2 50	....	....	....
Sag Harbor	....	....	....	1 00
Salem, Mass.	2 00	2 50	2 80	2 05
Salisbury Pt., Mass.	....	....	....	....
Savannah, Ga.	....	1 50	....	....
Stamford	*85	....	....	90
Stonington	....	....	....	....
Taunton	.. .	...	....	....
Trenton, N. J.	....	....	....	....
Troy	...	....	....	....
Warren, R. I.	....	....	....	1 00
Washington, D. C.	1 00	....	....	....
Wareham	....	1 75	2 10	....
Weymouth	2 00	2 25	2 75	....
Wilmington, Del	....	85	....	....
Wilmington, N. C.	....	1 50	....	....

* And discharging and towing. † And discharging.
‡ And towing. § 3c. per bridge extra.
‖ The rate to this point by barge is $1 70. †† Afloat.

From Philadelphia to all places on the Hudson River the rate is 85c., and discharging and towage according to destination.

¶ These rates are very irregular and our quotations may be considered nominal.

Freights on Bituminous Coals from the Mines to Tide-Water Shipping Ports.

From the Mines to Cumberland and State Line (say an average of 20 miles) the charge is 3 cents per ton of 2240 lb. per mile.

From State Line to Amboy (346 miles) $3 75 per ton of 2000 lb. On coal shipped beyond this point there is a drawback of 50 cents per net ton.

From Cumberland to Baltimore (178 miles) $2 31 per ton of 2240 lb., or $2 02 per net ton, and 4 cents per gross ton for use of cars.

From Cumberland to Georgetown (152 miles) by canal, $1 15. Tolls, 51 cents.

From the Mines to Piedmont (from 4 to 10 miles) 5 cents per ton of 2240 lb. per mile on distances less than 5 miles, and 4 cents per ton per mile on distances not over 10 miles.

From Piedmont to Baltimore (206 miles) $2 69 per ton of 2240 lb., or $2 40 per net ton.

From any point in the Kanawha Valley to the James River wharves below Richmond, (say 350 miles) by C. and O. R.R., including terminal charges, per ton of 2240 lb. For Cannel coal, $4 50.

Do. do., for Semi-Cannel or Splint, per ton of 2240 lb., subject to rebate on shipments of 5000 tons or more, $3 65.

From Irwin to W. Phila (say 332 miles) per P. R R. Penn. Westmoreland gas coal, per ton 2000 lb.	$4 75
From Osceola to W. Phila (say 248 miles) per T. & C. R. R., per ton bituminous coal of 2000 lb., 6c. extra for cross roads. Drawbacks, according to destination of coal	3 50
From Fairmount and Clarksburg to Baltimore (say 300 miles) via B. & O. R. R. including loading, per 2000 lb	4 75
On through coal after deducting drawback	....
From Richmond, Va., to New York, via vessel, 392 miles per 2240 lb.	1 60
" " " *Boston*, about 650 " " "	2 00
" " " *Philadelphia*, 292 " " "	1 25
From the Min s to Richmond, via James River and Kanawha Canal, 15 miles	15

BELCIAN IRON AND COAL TRADES.

Specially reported by E. MÜLLER & Co.

ANTWERP, Dec. 6th, 1875.

IRON.—There is no new feature to report in our market, and prices remain unaltered. How long this nu'lity of affairs may continue it is impossible to estimate, but again, as at this time last year, when such sanguine hopes were entertained of an improvement during the current year, many entertain lively hopes for next year, but whether they will be realized, is difficult to say.

COAL.—Manufacturing qualities are still but little sought after, but house coals have been in fair demand in consequence of recent and continued frosts. Quotations unchanged.

BRITISH MARKETS.

LIVERPOOL, December 9, 1875.

TIN PLATES.—Since our last there has been considerable buying, and even more inquiry, and the result of this is to make low sellers more independent, and confirm those who were holding out for higher prices, in their opinion of the future of the market. On every side manufacturers show a strong indisposition to continue working at even the slightly advanced rates noted this week. Quotations for delivery over the first three months of next year are difficult to procure, and range from 3d. to 1/ over figures for immediate delivery.

FINISHED IRON.—Makers are largely supplied with orders, and the mills for the larger sizes are mostly standing. There is, however, little giving way in price, and the Staffordshire makers are firm at £7 17/ 6d. to £8 for Bars. Very good quality can be procured at from £7 12/ 6d. to £7 15/ of other makes, quite suitable for all ordinary purposes. Hoops firm at £9 7/ 6d. to £9 10/.

LEAD rather firmer, and following are lowest: Spanish pig, £21 12/ 6d.; English pig, £22 5/; sheet, £23 10/; water pipe, £24; gas pipe, £24 10/.

FREIGHTS.—Figures for Canada are exceedingly low. New York, 12/ 6d.; Boston, 12/ 6d.; Baltimore, 12/ 6d.; Philadelphia, 15/; Montreal, 22/ 6d.; Quebec, 22/ 6d.; Toronto, 27/ 6d.; Hamilton, 27/ 6d.

ROBERT COOKS & Co.

MESSRS. VON DADELSZEN & NORTH, of London, under date of December 6, say the following of Tin:

"Referring to 'the expected increase of supplies from Australia,' we subjoin what a correspondent from there, under date 13th October, writes us:—

'A friend of mine, who has just returned from a visit to the tin districts, informs me that the production of the Queensland mines is falling off, the ground being rapidly worked out. On this side the border, with the exception of a few of the best, the mines can hardly be paying, with tin so low as it is now. There is not likely to be much change in the quantity delivered for some little time; but in the course of a year or two most of the land now being worked will be exhausted, and unless fresh discoveries are made, and new ground taken up, there will be a falling off.'

"We cannot, with this information before us, see anything to lead our 'expectations' to look for an increase in the supply of Australian tin; on the contrary, 'they rather go the other way.'

"Again, with reference to the quantity of ores stored at the Cornish mines, it is so far true that there is probably some 600 to 800 tons, say 400 to 500 tons metal, held back, but then there has been quite as much any time of this year, and we may be sure this will continue to be the case till some improvement in the market takes place.

"It is indisputable that great efforts are being made to depress the market, and frighten holders to part with their stocks. Rumors have reached us that important bear sales open all the year will have to be covered this month, and as it is certain that our stock here will show a reduction by the 31st of the month, owing to the small quantity of fresh tin which can come in, it is natural that those interested should do the best for themselves; but we would repeat that it is hardly likely the supply of straits will keep up to an average of 750 tons a month, much less exceed it; or that the supply of Australian will exceed an average of 600 tons a month for its future rate."

"The consumption of tin during the year has increased wonderfully, and at present prices is likely to be still further developed. The recuperative power of our commerce is by all acknowledged, and after so long a period of depression, may be expected soon to assert

itself; with a return of confidence, we should undoubtedly see an improvement in the position of tin."

"Much discussion has taken place as to what will be the effect, if any, of the disturbances in the Malay Peninsula upon the supply of Straits for the next few months; but so much must depend upon the time they continue, and the causes which led to them, of which, at present, owing to the break in the cable, we are almost in ignorance, that any conclusion we may come to must be based on conjecture rather than on fact. We feel sure that there must be something more serious in the affair than we are at present aware of, or so many troops would not have been sent forward, and such a powerful demonstration made. If the last telegram be confirmed, that there is a general rising of the Malays, we may find the insurrection last longer than we anticipated; meanwhile the supplies must be kept back, and production in that quarter stopped."

"We cannot help thinking that the writer in the *Mining Journal*, of last week, whose 'expectations led him to anticipate rather an increase than falling off in the supplies from the Straits,' has given us another illustration of the 'Wish being father to the Though.' The supplies from the Straits, for this year, have been the largest ever known—more than equalling those for the corresponding eleven months of 1873 and 1874 put together, and 25 per cent. in excess of 1872, which had hitherto been the largest recorded. Is it then—in the name of common sense—probable (irrespective of the present insurrection), that this extraordinary rate of supply will be maintained; unless, indeed, some new sources have been discoverad, of the existence of which we were hitherto unaware."

JOHN H. AUSTIN & Co., of London, under date of December 8, quote us as follows:

American rails 50@60 lb. per yard, £6 10/@£6 15/ per ton f. o. b. Wales; American Rails 50@60 lb. per yard £6 10/@£6 15/ per ton f. o. b. East Coast; Steel rails, £9 10/ per ton f. o. b. Wales; Steel rails, £9 10/@£10 10/ per ton f. o. b. Liverpool or East Coast.

Messrs. W. W. and G. RICHARDSON's monthly report of exports of railway iron from Great Britain extracted from Government returns:

To	Month ending Nov. 30.	11 Months ending November 30.		
	1875 Tons.	1873. Tons.	1874. Tons.	1875. Tons.
United States	44	177,955	93,445	17,755
Russia	7,607	160,401	145,246	100,781
Turkey	....	10,13[illegible]	10 497	1,180
British India	1,602	15,461	37,642	33,282
British North America	142	54,534	62,000	84,750
Egypt	121	10,23	11,251	6,959
Australia	6,548	27,788	80,839	74,765
Brazil	3,895	14,429	21,177	14,612
Holland	16	19,922	18 012	6,795
Spain & Canaries	493	12,984	22,782	10,092
Sweden & Norway	3,445	45,960	67,121	52,351
Chili	261	4,588	19.563	14,358
Denmark	53	11,145	9,989	6,991
Peru	1,851	8,438	12,596	13,875
France	3	2,441	2,908	113
Germany	742	36,512	7,152	4,079
Belgium	13	26,080	14,665	479
Italy	231	29,228	13,048	11,122
Other Countries	6,554	69,015	103,408	58,491
Total	33 621	737 250	753,341	521,833
Total exports from Great Britain of iron and steel to all countries	195,130	2,777,276	2,317,535	2,293,850

Scotch Pig Iron.

GLASGOW, December 7, 1875.

The Warrant Market continued very firm during the past week, and a large business was done betwixt 62/3d. and 63/, closing yesterday at 62/9d.

To-day there was more anxiety shown to buy, and a very large business was done from 63/3d. to 63/6d. cash, and 63/6d. to 63/9 one month, closing with buyers at the lower prices, and sellers at the higher.

There has been a more active demand for maker's iron, and the undernoted quotations mark a general improvement.

	No. 1	No. 3
G. m. b. at Glasgow (deliverable alongside)	64/6	63/
Gartsherrie, " "	74/	65/6
Coltness, " "	77/6	66/6
Summerlee, " "	70/	64/
Glengarnock, at Ardrossan "	70/	65/
Eglinton, " "	64/6	63/6
Bar Iron	£8 to £8 10/.	
Nail Rods	£9	

SHIPMENTS.

Week ending Dec. 5, 1874	11,122	tons.
" Dec. 4, 1875	9,876	"
Decrease	1,336	"
Total increase for 1875	82,391	"

IMPORTS OF MIDDLESBRO PIG IRON INTO GRANGEMOUTH.

Week ending Dec 4, 1875	3,626	tons.
" Dec. 5, 1875	2,650	"
Increase	976	"
Total increase for 1875	14,445	"

WILLIAM COLVIN & Co.

IRON MARKET REVIEW.

Import Duties.

The following are the duties in Gold:

Flat Iron, not less than 1, nor more than 6 inches wide, nor less than ¼, nor more than 2 inches thick. *Round Iron*, not less than ¼, nor more than 2 inches in diameter, and *Square Iron*, not less than ¼, nor more than 2 inches square per pound 1 c.

Flat, Round or Square Iron, of larger or smaller sizes than the above mentioned, per lb ..... 1½c.

Provided, that all iron in slabs, blooms, loops, or other forms, less finished than bars, and more advanced than pig iron, except castings, shall pay the same as iron in bars.

Provided, that none of the above iron shall pay less than 35 per cent.

Railroad Bars—Iron ..... 70c. per 100 lb

Railroad Bars—Steel ..... $1.25 per 100 lb.

Boiler plates, or other plate iron not less than 3-16 of an inch thick, per lb ..... 1½c.

Scrap Castings per ton $6 00

" *wrought* " " 8 00

Pig Iron per ton 7 00

Iron ore 20 per cent. *ad valorem*.

Antimony. crude or regulus, 10 per cent.

Copper Ore—On all fine contained therein, 3c. per lb.

Old Copper, fit for manufacture only, 4c. per lb.

Copper, pigs, bars, ingots or plates, 5c. per lb.

" sheets, bolts, nails, spikes, rods, pipes, &c., 45 per cent.

Tin, in bars, blocks or pigs, and grain tin, free.

Tin Plates, or sheet, and terne or taggers tin, 1 1-10c. per lb.

Lead—Bars or pigs, 2c. per lb. Old lead, for manufacture only, 1¼c. per lb. Pipes, shot and sheets, 2¾c. per lb.

Zinc, in blocks or pigs, 1½c. per lb.; in sheets, 2¼c. per lb. manufactures of, 35 per cent.

Quicksilver free.

New York.

FRIDAY EVENING, Dec. 24, 1875.

American Pig.—There has been but little business done in this article during the past week; and there are no indications of any important transactions likely to take place soon. There are rumors that several large companies have hypothecated considerable quantities of pig iron. If a revival in the demand for iron does not take place soon, and the furnaces now in blast continue to increase the already enormous stocks, a further decline in prices is inevitable. The most careful students of the position do not anticipate an early improvement and are looking for a further decline. We quote No. 1 foundat $23; No. 2, $21; and forge, $15 to $20. We are unable to learn of any iron bringing more than our higher quotations, while we are aware of numerous sales at less. $19 may be considered even a high price for good forge irons, although, for special uses, some brands bring more.

Scotch Pig.—The sales of this article are mostly confined to 5 and 10 ton lots. Prices, however, continue firm under small importations and owing to the firmness of the Glasgow markets, and the stocks here being held by strong hands. We quote Coltness at $33; Glengarnock, $31; and Eglinton, $29 50@30.

Rails.—In our last we reported sales of about 20,000 tons of steel rails. We have since learned that this was a portion 32,000 tons sold to the Pennsylvania Railroad, and that the Erie Railway has purchased 5,000 tons. It is estimated that contracts have been made for the delivery of about 120,000 tons of steel rails during 1876. There has been some business done in iron rails, the particulars of which we have not ascertained. We quote iron rails, at mills, at $43@48, and steel at $65@70.

Old Rails.—There have been no further transactions in old rails, which we quote, according to the two last sales, at $22 50.

Scrap.—This article is very quiet, and is quoted at $30@31.

Philadelphia, Pa.

Weekly report of the Philadelphia Iron Market, furnished by Messrs. JUSTICE COX & Co., Iron Merchants, 333 Walnut street, Philadelphia Week ending Dec. 23, 1875.

The market continues quiet and the low prices quoted are still used to beat down prices of good iron. Little business will be done until after the New Year comes in, when it is hoped some price can be reached that will hold good for a month or two. The only lively business being done now is in steel rails. There are sales reported this week of 25 000 tons at about $67 50 at works; also, 2,500 tons new iron rails at $47 50. This demand for rails must make some demand for pig iron, in fact good grey forge iron is the scarcest iron in the market. Large sales of good forge could be made if producers would contract for next year's deliveries at the quoted price. We hear of an offer of $21 for 5,000 tons next year's delivery, a good forge iron being refused. We quote No. 1, $23@$24; No. 2, $21@$22; gray forge, $20@$22.

Bar Iron is very dull of sale at 2.5-10.

Old Rails—Some sales are reported at $25 50.

Scrap is in demand and scarce at $27@$29.

Cast Scrap is quoted $17@$20

Baltimore. Dec. 22, 1875.

Specially reported by Messrs. R. C. HOFFMAN & Co.

The iron market continues dull, and we look for no revival of trade until after the Holidays, if then. We quote:

Baltimore Charcoal	$32@35	Anthracite No. 3	$21@22
Virginia Charcoal	28@34	Mottled and White	18@19
Anthracite No. 1	24@25	Charcoal C. B Blooms,	70@75
" No. 2	23@24	Refined Blooms	60@65

Boston. Dec. 18, 1875.

PIG remains in *statu quo*. The New York and Philadelphia markets have taken quotations in the most singular vagaries, from a No. 1 at $22 f. o. b., cash down, to $23 50, f. o. b., 4 months, good paper. This market, now freed from some of its most anxiously impending stock, assumes a trifle more steadiness, and quotes No. 1 $24@$26; No. 2, $22@$24; and gray forge, $19@$21, at which values the sales made are small and cautious.

BAR has had a lively week. The action of a leading house in again reducing values $1 a ton, has led to a great deal of gossip. The selling of guaranteed refined iron at $51 50 in this market, will astonish the trade elsewhere, but, as a young and vigorous house has met this last drop, and is understood as willing to meet anything else, it is a cheerful prospect for consumers. The exact object of this last break is variously discussed. While one thinks it is a desire to break manufacturers and so get a chance to buy in two or three thousand tons, another insists it is a plan to control the trade; another, to break some "other feller's" back, and still others insist it is a plan to bring all the iron trade to realize on the cheap markets and low freights New York and Philadelphia are so envious of. The houses participating in this raid on values, pursue the even tenor of their way in good, cheerful moods, and are rapidly selling down their stocks. Leading mill men from Cleveland, Buffalo, Pittsburgh and Philadelphia, have been here this week, and as far as learned refused to take orders at $51 50 delivered at our wharves or depots. The lowest point was from a Pittsburgh house naming 2c. on a 500-ton order, and guaranteeing a 30c. freight; but then no extra allowances on sizes necessary for this market would be given.

STEEL is having a fair business with tool a trifle irregular, and selling, as to brand, both below and above our quotations. The line of machinery quoted in our last claims to be in thorough assortment, and contradicts the report of sale of choice sizes.

We quote American tool, 14@15c.; American Machinery, 9@9½c.; Bessemer tires, 6½@7¼c.; SWEET'S Excelsior Tire, 8½@12c.; English tool, 16@18c., gold.

COPPER is held very firm, with very little inquiry, and very little being pressed for sale. Ingot quotes at 23½ to 23¼c., for either spot or future, the inside range being that more generally paid on the few sales made.

For manufacturers we quote new sheathing, 30c.; bolts and braziers, 31c.; yellow metal bolts, 20@29c.

LEAD is steady and unchanged, with stock, both in first and jobbing hands, very light.

We quote pig 6c. for domestic, and 6¼@6½c. for foreign; sheet and pipe lead, 9c. currency; tin-lined pipe, 16½c.; bar lead, 9c. less usual trade or 10 per cent. discount.

ANTIMONY is firm, with a small inquiry at 13½c.

SPELTER is strong and quiet at $7 45, 30 days, and $7 35, prompt cash, all currency. Silesian is dull at $7 75. Sales of 50 tons at 6¾c., gold.

TIN is a little lower from ¼ to ½c. on pig, and here held very steady. Plates are having a moderate inquiry, with the stocks not over large.

We quote Straits, 19½c.; banca, 24c.; Refined English, 19½c., gold. Plates are active. We quote charcoal I. C., $7 50; coke, $6 75@7; and terne at $6 30@6 75, gold.—*Commercial Bulletin*.

Cincinnati. Dec. 21, 1875.

Specially reported by Messrs. TRABER & AUBERY, commission merchants for the sale of pig iron, blooms, ore, etc.

Below please find closing quotations of our pig iron market:

CHARCOAL.

Hanging Rock, No. 1 Foundry	$25 00@26 00	—4 mos
" No 2, "	23 00@24 00	—4 mos
" Mill	22 00@	—4 mos
Tennessee No. 1, Foundry	23 00@24 00	—4 mos
Tennessee, No. 2, "	22 00@23 00	—4 mos
" Mill	22 00@	—4 mos
Missouri, No. 1, Foundry	@	—4 mos

STONE COAL.

Ohio, No. 1, Foundry	23 00@ ...	—4 mos
" No. 2, "	22 00@22 50	—4 mos
Ohio Mill	21 00@	—4 mos
Missouri, No. 1 Foundry	27 00@28 00	—4 mos
" No. 2, "	26 00@27 00	—4 mos
" Mill	26 00@27 00	—4 mos

CAR-WHEELS.

Hanging Rock, C. B	40 00@50 00	—4 mos
Tennessee "	30 00@35 00	—4 mos
Missouri "	35 00@40 00	—4 mos
Alabama "	30 00@35 00	—4 mos

BLOOMS.

Charcoal	60 00@ 80 00	—cash

SCRAP IRON.

Cast	50c.@ 60	—cash
Wrought	1 00@1 15	—cash

Chicago. Dec. 21, 1875.

Specially reported by Messrs. ROGERS & Co., dealers in Scotch and American pig iron.

No change in prices.

No. 1 Coltness	$40 00@ ....
No. 1 Gartsherrie	40 00@ ....

No. 1 Summerlee	38 00@ ....
No. 1 Glengarnock	37 00@ ....
No. 1 Eglinton	36 00@ ....
Warner's "American Scotch"	34 00@ ....
Massilon No. 1 Foundry	31 00@ ....
No. 1 Grand Tower Mo. ores (Bituminous)	29 00@ ....
No. 2, " " "	28 00@ ....
No. 1 Mill	25 00@ ....
No. 1 Foundry, Ohio	28 00@ ....
No. 2 " "	27 00@ ....
No. 1 Hanging Rock (charcoal)	30 00@ ....
No. 2 " " "	24 00@ ....
Union "A" 1 (Anthracite)	28 00@ ....
Union "B" 1 (Anthracite)	26 00@ ....
No. 1 Lake Superior (charcoal)	30 00@ ....
No. 2 Lake Superior "	28 00@ ....
No. 3 Lake Superior "	30 00@ ....
No. 4 Lake Superior "	32 00@ ....
Bessemer Steel Rails	72 00@ ....
New Iron Rails	50 00@ ....
Old Rails	28 00@ ....

Cleveland, Ohio, Dec. 21, 1875.

Messrs. C. E. BINGHAM & Co., quote as follows:

Per gross ton, on four month's time. Subject to change in market. Discount for cash 4 per cent.

FOUNDRY IRON.

No. 1, Lake Superior Charcoal	23 00@....
No. 2, "	28 50@....
No. 1, Anthracite	26 50@....
No 2, "	25 00@....
No. 1, Bituminous foundry	26 50@ ...
No. 2, "	25 00@....
American Scotch, No. 1, Cherry Valley	29 50@....
" " B—1, " "	27 50@....
" " No. 2, " "	26 00@....
No. 1, Massilon	28 00@....
B—1, "	26 00@....
No. 2, "	23 00@....

CAR WHEEL AND MALLEABLE IRON.

No. 3 Lake Superior Charcoal	27 50@....
No. 4 " "	29 00@....
Nos. 5 and 6 " "	29 00@....

BESSEMER IRON.

Nos. 1 and 2 Lake Superior Charcoal	28 50@....

FORGE IRON.

No. 1, Gray	23 50@....
White and Mottled	22 50@....

Indianapolis, Ind. Dec 21, 1875.

Specially reported by NELSON KINGMAN, broker and dealer in pig iron, etc.

Prices remain the same.

Trade very dull at prices named below.

New Rails at mill	$48 00@50 00
Old Rails "	24 00@26 00
Hanging Rock Charcoal Pig No. 1 foundry	28 00@29 00—4 mos
" " " " " 2 "	26 00@28 00—4 mos
" " " " Mill	24 00@26 00—4 mos
Car Wheel C. B	40 co, nominal.

STONE COAL.

Indiana No. 1 Foundry pig Red Short	24 00@26 00—4 mos
" 2 " " "	22 00@24 00—4 mos
" 1 Forge " "	....@ ....—4 mos
" 2 " " "	....@ ....—4 mos
Ohio No. 1 Foundry pig Cold Short	25 00@26 00—4 mos
" 2 "	24 00@25 00—4 mos
" Mill	23 00@24 00—4 mos
" No. 1 Foundry, Neutral	26 00@28 00—4 mos
" No. 2 " "	25 00@27 00—4 mos
Merchant Bar	2¼c.—3 mos
1st quality C. H. No. 1 Boiler Plates, per lb	5 c.—3 mos
1st " Com. Sheet for No. 24, W.G. "	4 c.—3 mos
1st " Charcoal Sheet " " "	5½c.—3 mos
Best Bloom Galvanized Sheet, discount 20 per cent	—cash.
2d quality " " " 30 "	—cash.

f. o. b. in Indianapolis.

Louisville. Dec. 21, 1875.

Specially reported by Messrs. GEORGE H. HULL & Co.

The market continues dull, with small sales, mostly at inside figures.

The usual time, four mos., is allowed on the quotations below:

HOT BLAST—CHARCOAL.

No. 1 foundry, from Hanging Rock Ores	$25 00@26 00
No. 2 " " "	23 00@24 00
No. 1, Mill, from " "	—@—
No. 1, foundry, from Alabama, Georgia and Tennessee ores	23 00@24 00
No. 2, foundry, from Ala., Geor'a and Tenn. ores	22 00@23 00
No. 1, Mill, from " " " " "	21 00@22 00

HOT BLAST—STONE COAL AND COKE.

No. 1, foundry, from Hanging Rock ores	23 00@24 00
No. 2, " " " " "	22 00@23 00
No. 1, Mill, " " " "	21 00@22 00
No. 1, foundry, from Ala. Ga. and Tenn. ores	23 00@24 00
No. 2, " " " " "	22 00@23 00
No. 1, Mill, " " " "	21 00@22 00
No. 1 foundry, from Missouri ores	24 00@25 00
No. 2 foundry, from Missouri ores	24 00@25 00
No. 1 Mill, from Missouri ores	25 00@26 00

COLD BLAST—CHARCOAL.

Car Wheel from Hanging Rock ores	35 00@40 00
" " Tennessee "	28 00@30 00
" " Alabama and Georgia ores	28 00@38 00
" " Kentucky ores	28 00@40 00

Milwaukee. Dec. 21, 1875.

The following are the present prices, per ton of 2,240 lb.:—

Frankfort L. S. Charcoal,	No 1	$30 00
" " "	No. 2 & 3	28 00
" " "	No. 4 & 5	31 00
" " "	No. 6	35 00
Mil. Anthracite L. S.,	No. 1	30 00
" " "	No. 2	28 00
Wisconsin Iron,	No. 1	26 00
Mahoning Valley Bit's	No. 1	32 00
" " "	No. 2	30 00

Pittsburgh. Dec. 22, 1875.

Specially reported by A. H. CHILDS, Esq.

No change in prices.

Richmond, Va. Dec. 21, 1875.

Reported by ASA SNYDER, Esq.

Market very quiet—receipts and sales very light—business mostly suspended for the season. We quote:

Virginia Cold Blast Charcoal Pig Iron			$27 to $33
" Warm " "	" "		24 to 28
" " " Coke	" "	1 X	24 to 25
" " " "	" "	2 X	22 to 23
" " " "	" "	3	21 to 22
" Anthracite	1 X		25 to 26
" "	2 X		23 to 24
" "	3		22 to 23

St. Louis. Dec. 21, 1875.

Specially reported by Messrs. SPOONER & COLLINS, Commission Agents for all kinds of Iron.

We notice but little demand, with no change in prices.

Mo. Stone Coal	No. 1 Fy.	$26@27	
" " "	2 "	24½@25	
" "	Gray Mill,	23½@24	
" Charcoal	No. 1, Fdy.	26@27	
" " "	2, "	23¾@24	
" "	Gray Mill,	23@24	
Tenn. "	No. 1, Fdy.	25@26	
" " "	2, "	23@24	
" "	Gray Mill,	22@23	
" Coke,	No. 1, Fdy.	25@26	
" " "	2, "	23@24	
" "	Gray Mill,	23@24	
H. R. Char.	No. 1, Fdy.	26@27	
" " "	2, "	24@25	
" "	Gray Mill,	24@25	

Massillon iron, A No. 1	34@35
" " B " 1	32@33
" " " 2	30@31
Cold Bl. Car Wheel, Mo.	32@35
" " " Tenn.	30@32
" " " Ala.	30@32
" " " H. R.	35@40
Mo. Charcoal Blooms	60@65
" Scrap "	60@65
" " hammered Billets	8c@90
Assorted Bar Iron	2 4-10c.
No. 1 Wrought Scrap	1c.
Heavy cast "	¾c.
Light " "	½c.

Montreal. Dec. 13, 1875.

We quote pig iron:—Eglinton and Clyde, $21@$21 50; Carnbroe, $21 50@$22 50; American, $24 to $26; Summerlee and Calder, $21 00 to $22 50; Langloan & Gartsherrie, $23 00 to $23 50; Coltness, $24 00 to 24 50; Hematite, $30 to $31. Bar, per 100 lb., Scotch and Staffordshire, $2 30 to $2 40; best do., $2 55 to $2 65, Swedes and Norway, $5 00 to $5 50; Lowmoor and Bowling, $50 to $7 00.—*Monetary Times.*

METALS.

NEW YORK, FRIDAY EVENING, Dec. 24, 1875.

The approach of the Holidays has drawn the attention of all to other things than business in metals, so that we find the greatest quietness in all branches, with no expectations of an improvement until after the different firms have taken an account of stock, and their actual standing is shown by balance sheets. To many the year about expiring has resulted in heavy losses, while but few are likely to show profits.

Gold Coin —During the week past gold has ranged from 112⅞@114¼ and closed, yesterday, at 113⅛.

Bullion.—Fine silver bar is quoted at $1 23@$1 24, gold, per ounce. and fine gold bar at par ($20 67, gold, per ounce,) to ¼ per cent. premium.

Copper.—The sales during the week foot up about 200,000 lb. of Lake Superior at 23⅞c. The quotations today range from 23¼@23½c. with but little offering and less asked for. Chili Bars were quoted at £81 10/ in London yesterday.

Tin.—Under lower quotations in London, and a very quiet market here, prices have taken a downward tendency. The following is the range of quotations given us: Straits, 19@19½c.; English Refined, 19@19½c; L. and F., 18½@19c.; and Banca, 23½@24c.; prices all gold. We are reported sales of L. and F. for next year's delivery at 18½c., gold. The reports from Malacca indicate that the troubles there are of a more serious nature than were anticipated last week; but the reports are not sufficiently definite to enable us to draw satisfactory conclusions. Straits was quoted at £82 10/ in London, yesterday. No change is reported in the Singapore quotation.

Tin Plates although quiet are firm. We quote charcoal tin, per box, gold, at $7 37¼ and ternes $7@7 25; coke tins, $6 75 and ternes $6 25@$6 50.

Lead.—The sales during the week have aggregated about 250 tons at 5·90c.@5·95c. gold. Foreign lead is quiet at 7¼c. gold. Soft Missouri is very firm at 7½c. currency at St. Louis.

Spelter and Zinc.—Domestic is very quiet at 7¼c currency. There is nothing doing in Foreign which is quoted at 7·15c.@7·37½c gold. Sheet zinc is quiet at 8¾c.@9c. gold.

Antimony.—The sales made during the past week have been at 14¼c. gold, at which figure it is firmly quoted now.

Quicksilver.—The quotation in this market is 75c. per lb.; in San Francisco 70c.; and in London £10 10. per flask of 75 lb.

Sundry Quotations.

Fire Brick per 1000 (B. KREISCHER & SON)	$40@45@50 00
Clay retorts 12x20	@15@30 30@45 00
Tiles and blocks per 100 cubic inches	12
Ground clay per bbl	2 50
" brick "	4 00
Rosedale cement per bbl	$ 1 10@ 1 20
Portland " "	3 50@ 4 25
Roman " "	3 50@ 4 25
Koenes coarse cement per bbl.	8 00@ 8 50
fine " "	12 00@12 50

FINANCIAL.

New York Stocks.

FRIDAY, Dec. 24, 1875.

We note a general decline in the stocks dealt in at the New York Stock Board, with limited transactions. Bonds are decidedly firmer; the 1st consolidated mortgage issues of the N. J. R.R. have advanced 2¼ per cent., with sales of $74,000 for the week. The total dealings of the list aggregate $149,100, at generally advanced prices. We note a sale of 800 shares of stock (hypothecated) of the American Coal Company at auction, recently, at $48½ per share par $25. The annual election of this Company will be held in New York on the 30 inst.

The guaranteed half-yearly dividend on the Morris and Essex stock will be paid by the Delaware, Lackawanna and Western Company (lessees) on and after Jan. 1.

The Delaware, Lackawanna and Western R.R. Company have followed the example of the Pennsylvania Railroad Company in reducing the wages of the laboring men to ninety cents a day.

The report of the Chesapeake and Ohio Canal Co., states that the coal tonnage for the month of November 1875, was 99,439 tons, which is an increase, as compared with November, 1874, of 27,641 tons. The gross revenue which accrued to the treasury during the month was $54,943 43, which is an increase, as compared with the corresponding period of 1874, of $12,299 37, viz:

Gross revenue for November, 1875	$54,943 43
Gross revenue for November, 1874	42,644 06
Increase	$12,299 37

The expenses for operating and maintaining the canal, other than wharf expenses, but including cost of material for winter repair, was $22,451 49.

The net revenue for the month was $32,491 94, being an increase in favor of November, 1875, of $11,959 45.

Balance in bank on December 4, 1875, $92,180 87; accrued revenue uncollected was $30,000, making $122,180-87, which, with amount due from rent, estimated at $20,000, will enable the board to pay the next coupons due January 1, 1864, which will be paid on and after December 29, at Baltimore.

The annual meeting of the stockholders of the BLAIR Iron & Steel Co. will be held in New York on the 4th of Jan. prox.

The annual meeting of the stockholders of the Fairchance Iron Co., of Pennsylvania, will be held in New York on the 12th of Jan. 1876.

It is announced that the Delaware & Raritan Canal will be closed for navigation at midnight to-night.

Quotations and Sales of Stocks and Bonds,

For the week ending Dec. 24, 1875.

STOCKS.

	Highest	Lowest	Closing	Shares sold.
Pennsylvania Coal Co	—	—	†277½	—
Consolidation Coal Co	—	—	47	80
Spring Mt. Coal Co	62¼	62	62	800
American Coal Co	—	—	48½	—
Maryland Coal Co	—	—	18	—
Del., Lack., and West. RR. Co	120	119¾	119¾	1852
New Jersey Central RR. Co	105⅝	105	105	2274
Delaware and Hudson Canal Co	123	122⅜	123	339
Quicksilver Mining Co. pref'd	—	—	24	700
" " " Common	18¼	17½	17⅝	300
Mariposa Land & Min. Co. various	9¾	7¼	9⅛	1547
St. Louis & Iron Mountain RR	15½	15	15	278
Lehigh & Wilkes-Barre Coal Co	—	—	40	—
Total Shares sold				8170
Sales for the week previous				9876
Decrease				1706

BONDS.

	Sales.		Price
Ches. & O. R. R. 6s, 1st. cou. on	—	.....	— @ —
" " " ex coupon	—	.....	— @ 21
Central RR. of N. J. 1st Mtg. N.	4,000	.....	— @115¼
" " " 1st Cons.	74,000	.....	110¾@111¼
" " " Convt.	30,000	.....	106 @106¼
Del. and H. Canal, 1st Mtg. '77	—	.....	— @ —
" " 7s, '94	24,000	.....	108 @109
" " Reg. '91	11,100	.....	— @113¼
Del., Lack. & W. R. R., 7s, conv.	—	.....	— @124
" " " 2d Mtg.	—	.....	— @114
St. Louis & Iron Mount'n 1st Mtg	6,000	.....	— @ 94
St. Louis & Iron M'tn, 2d Mtg.	—	.....	— @ 51†
Lehigh & Wilkes-Barre Cons.	—	.....	— @ 96
Total Sales	$149,100		

Closing quotations, in the absence of sales, represent the latest prices bid.

† Asked.

Philadelphia Stocks.

PHILADELPHIA, Dec. 24, 1875.

Outside of an unusual activity in the shares of Railways doing a large passenger business, the dealings in the Philadelphia Stock Market for the week have been very limited, and prices exhibit a general decline from our last quotations. The stock of the Pennsylvania R. R. Co. shows an advance of over one per cent., with transactions for the week amounting to 47,000 shares; being an increase of nearly 18,000 shares above the sales reported in our last. The shares of the Cambria Iron Co. exhibit a slight advance, with sales of over 300 shares for the week. We note a sale of $5,000 of the Lycoming Gas and Water Co.'s 6 per cent. bonds at 85.

The following were sold at auction during the week at the prices annexed: $11,000 Reading Coal and Iron Co., debenture coupon, 7 per cent. bonds, guaranteed by the the Reading R. R. Co., at from 83 to 83½, also $4,000 of the Colebrookdale R. R. 1st mortage, coupon, 6 per cent. bonds, guaranteed by the Pennsylvania R.R. Co., at 81½.

The Corporators of the Delaware Copper Mining Co., of Michigan, will hold their first meeting in Philadelphia on the 3rd of January, 1876.

Quotations and Sales of Stocks and Bonds,

For the week ending Dec. 24, 1875.

STOCKS.

	Highest	Lowest	Closing	Shr's
Lehigh Valley RR. Co	63	61¾	61¾	146
Pennsylvania RR.	52¼	51	52⅝	47100
Reading RR.	55½	55	55	3565
Lehigh Coal and Nav. Co	50	49⅝	49⅝	7076
Penn. Canal	—	—	9	—
Buck Mountain Coal Co.	—	—	—	—
Fulton Coal Co.	—	—	3½	—
Locust Mountain Coal Co	—	—	—	—
Westmoreland Coal Co.	—	—	80	—
St. Nicholas Coal Co.	—	—	1	—
Cambria Iron Co.	—	—	16¼	312
Crane Iron Co.	—	—	46	—
Emaus Iron Co	—	—	—	—
Pennsylvania Salt Manufact. Co.	76	75¼	75¾	37
Total shares sold				58,236
Sales for the week previous				41,585
Increase				16,651

BONDS.

	Sales.	Price
H. and B. T. RR. 1st mortgage, 7s	—	— @105½
" " " 2d " "	—	— @102
" " " 3d " cons	5,000	— @ 58
Lehigh Valley RR. Con. mtg. 6s, Reg	3,000	97¼@ 97½
" " 7s, 1910	19,000	— @111
" " 6s reg.	2 000	103½@104
Pennsylvania RR., 1st mtge. 6s	2,000	— @106
" " gen. " cou. 1910	16,000	103 @103¼
" " gen. " 6s, reg.	—	— @102½
Phil. & Reading RR. 7s '93	—	— @108¼
" " " G. M. 7s, cou. 1911	2,000	— @106¾
" " " " Deb. 6s	200	83 @ 83½
" " new convertible 7s	8,400	108 @109
Phil. & Reading C. & I. Co. 7s deb.	—	— @ 83½
" " " 6s Tam Tract	—	— @ 90
" " Glenthworth Tract	—	— @ 90
Lehigh Coal & Nav. Co., 6s '84	2,000	103 @104
" " " RR., '97	4,500	— @103¾
" " " Con m. 7s	—	— @101½
" " " gold, '97	9,500	103⅞@104½
Penn. Canal, 6s	4,000	— @ 72½
Penn. and N. Y. Canal, 7s	1,000	— @107
Ches. and Del. Canal, 6s	—	— @ 88
Susquehanna Coal Co. 7s	—	— @ 70
Buck. Mount Coal Co. 6s	—	— @ 97¼
Penn. Gas Coal Co. 6s	—	— @100¼
Total amount of sales	$78,600	

Closing quotations, in the absence of sales, represent the latest prices bid.

Gold and Silver Stocks.

NEW YORK, Dec. 24, 1875.

With but few exceptions mining shares have advanced, and the market appears more steady in the dealings than we have noticed for a long time past. Meadow Valley has declined from $3 to $1 per share. On the 20th inst. Consolidated Virginia was up to $400 per share; our report of the 23d inst. shows a decline of $18 from this figure, but an advance of $9 per share compared with our last quotations. This company is at present hoisting about 600 tons of ore per day from its shaft, the new hoisting apparatus having been re-built, and is now in full operation.

This amount of ore will produce about two millions of dollars worth of bullion per month. It is being crushed in the different mills on the Carson River, those of the Consolidated Virginia not yet being completed, though work is being pushed forward rapidly, and they will soon be in working order. The dividends of this company since January 1, 1875, have amounted to 65 per cent. of the product. The new assay office at the mines will have four times the capacity of the United States Assay Office at New York. It is reported that the managers contemplate increasing the stock of the company soon.

The Northern Belle Mining Company had its usual monthly dividend of one per cent. aggregating $50,000 on December 15.

The first shipment of bullion from the Justice Mine, which is on the south end of the Comstock Lode, was made last week, and amounted to $3,452.

The East Comstock Mining Company, of San Francisco, paid $25,000 gold in dividends on the 21st inst.

The Pioche Silver Mining Company have levied an assessment of 50 cents per share, which will be delinquent January 11th.

MINING NOTES.

The operations of the Gold Mountain Mining Company, on the northern lode of California, during the past season, show that the costs of mining, hoisting and reduction of gold ores in that section, average $2 60 per ton.

The Leopard mine and mill are being worked to good advantage, and it is stated that the Company will probably resume the payment of $1 dividends in December.

During the month of October, 3,322,000 pounds of bullion were shipped over the Utah Central Railroad, the greater portion of which was consigned to the Omaha, Chicago and St. Louis refineries.

The rain storms in California, as well as snow upon the mountains, this year have commenced about a month earlier than usual, which insures the extensive working of the hydraulic placer gold mines in that section, and the prospect is that the yield of bullion will gradually increase for some months to come.

The Stewart Reduction Works, at Georgetown, Colorado, were destroyed by fire on Sunday last, including the stamp mill, pan mill, settling house, retort works, smelting fernaces, as say office, engines and machinery. The works contained at the time ores and bullion valued at over $100.000. They were principally owned by a private party in New York, and were but lightly insured. These works produced silver bricks during the year, up to November 22d, of a total coin value of $271,661 72.

The New Albany Mining Co., to operate in Toulumne county, California, has recently organized with a capital stock of $3,000,000, in shares of $100 each. Also, the Rosecrans Gold Mining Co., to operate in Gorden Valley Mining District, El Dorado county, California, with a capital stock of $640,000, in 60,000 shares of $10 each.

For the week ending Dec. 8th, 11,707 feet had been driven in the Sutro Tunnel. A recent telegram from San Francisco reports that "several streaks of good ore" have been passed in the tunnel within a few days. The rock having become softer, the process of tunnelling is more rapid.

The Oakland Quicksilver Mining Company, operating in Cinnabar Mining District, Sonoma County, have levied an assessment of fifty cents per share. It will be delinquent January 13th. This is the first assessment of the Oakland Company.

The Panther Company of Cornucopia District have struck a ledge in the cross-cut from Geneva Tunnel. The vein is small, but rich; the average of four assays being $1,445 63.

SAN FRANCISCO, Dec. 22.

To-day 2,500 shares of the Bank of California stock sold at auction at $20 per share, and 200 shares at $18.

The exports of gold and silver from San Francisco, from Jan. 1st to Dec. 15, 1875, amounts to $42,112,369 63.

QUOTATIONS:

	No. of shares.	Dec. 16.	Dec. 23.
Sierra Nevada	100,000	20	$20
Union Consolidated	100,000	9	9
Mexican	108,000	18	19
Ophir	108,000	47	47
California	540,000	67	69
Consolidated Virginia	108,000	373	382
Best & Belcher	100,800	58	56
Gould & Curry	108,000	18	19
Savage	112,000	18	14
Hale and Norcross	16,000	44	48
Chollar Potosi	28,000	85	87
Alpha Consolidated	30,000	18	17
Imperial	100,000	8	8
Yellow Jacket	24,000	96	99
Kentuck	30,000	14	13
Crown Point	100,000	29	45?
Belcher	104,000	33	32
Overman	38,400	57	63
Caledonia	20.000	21	24
Justice	105,000	24	27
Raymond & Ely	30,000	18	17
Meadow Valley	60,000	3	1
Eureka Consolidated	50,000	15	16
Eureka G. V.	20,000	3	3

Copper Stocks.

Specially reported by Messrs. WILSON W. FAY & CO., Bankers and Brokers, room 7 Traveller Building, 31 State street, Boston.

BOSTON, WEDNESDAY EVENING, Dec. 22, 1875.

The market on Copper Stocks has been quiet during the week, and, probably, will be until the holidays have passed, when we look for more activity. The prices, considering the little doing, hold remarkably firm, especially the producing mines. Calumet has receded from 160½ to 159½, and closes at that bid. Allouez is very strong at 16½, and if the reports concerning it are true, is, undoubtedly, cheap. Duncan Silver has reacted from 1¼ to 1.10. Franklin has been sold at 14 and 13⅞. 1513 shares National Mining Co. will be sold at the office of the company January 19, 1876 at 11 o'clock A. M., unless the assessment of $1 per share, together with that at 7 per cent from Oct. 15, and all costs thereon shall be paid before said sale. Eastern RR. has again been the feature of the market, fluctuating between 8½ and 113¾ and closing at 10½@10⅝.

DESCRIPTION.	Par Value.	No. of Shares	CLOSING. Bid.	Asked.
Allouez	$50	20,000	$ 16½	$17
Calumet and Hecla	20	80,000	159½	159¾
Central	25	20,000	34 25	34 75
Copper Falls	25	20,000	5½	6
Dana	25	20,000	15	20
Duncan Silver	20	60,000	1 05	1 15
Franklin	25	20,000	13¼	14
Humboldt	25	20.000	25	30
Madisca	25	20,000	25	30
Mesnard	25	20,000	⅝	75
Minnesota	25	20,000	2 00	2½
National	25	20,000	2¼	2⅜
Petherick	25	20,000	45	55
Pewabic	25	20,000	4¾	5
Phenix	25	20,000		
Quincy	25	20,000	43 25	43 75
Ridge	25	20,000	6¼	6¾
Rockland	25	20,000	40	50
International Silver	—	—	20	15
Star	25	20,000	25	30
Superior	25	20,000	15	20
Eastern RR.			10½	10⅝

Gas Stocks.

NEW YORK, Dec. 24, 1875.

Gas stocks are lower with a drooping tendency. The stocks of the Nassau, Peoples, Metropolitan and Citizen's Gas Co.'s of Brooklyn, exhibit a decline ranging from 2 to 5 per cent. below quotations reported in our last. Sales for the week have been reported to us as follows: 200 shares of Manhattan, at from 207½ to 209½; 50 shares of New York, at from 149 to 150; 150 shares of the Peoples' of Brooklyn, at from 97 to 100. Small transactions of the Boston Gas Co. have occurred during the week at prices ranging from 772 to 775. We note recent sales of the San Francisco Gas Co. aggregating 400 shares at 94. At auction, during the week, we note sales of 100 shares of the People's' Gas Co., of Albany, N. Y. par $100—at $31 per share, also 400 shares of the Mutual, of Detroit, Michigan, par $50. at from 20½ to $24 per share.

The annual meeting of the Stockholders of the Metropolitan Gas Light Company for the election of directors etc., will be held at the Company's office in this city on January 10, 1876.

The agitation of the "Kerosene vs. Gas" question, is still going on and leaving its mark in the diminished value of gas stocks. A notable improvement in the quality of the gas furnished by some of our city companies, has recently been noted; the inevitable result of the energetic demands of the public for better value for their money.

The Tessie du Motay process will soon be in full operation here—making water gas. We shall make early note of these extensive works.

The following list of Companies in New York and vicinity are corrected weekly by GEORGE H PRENTISS, Broker and Dealer in Gas Stocks, No. 30 Broad st., N. Y.

Quotations "bid" and "asked" of New York City and Vicinity Gas Companies are on the $100 of stock and not on one share.

Companies in New York and Vicinity	Cap. Stk.	Par.	last Dividend.	When Paid.	Bid.	Askd.
			pr.c			
Mutual, N. Y.	$5,000,000	$ 100	2½	Oct. '75	110	111
" " Bonds	900,00	1,000	†3½	Aug. "	105	107¼
NewYork, "	4,000,000		5	Nov. "	147	148½
Metropol. "	2,500,000	100	5	Sept. "	155	157
" " Certf.	1,000,000	...	3½	" "	104	105
" " Bonds	500,000	1,000	3½	July, "	105	
Harlem "	1.850,000	50	4	Aug. "	135	138
Manhattan "	4,000,000	50	5	July, "	307	307½
Brooklyn, B'klyn	2,000,000	25	5	Nov. "	235	241
Nassau "	1,000,000	20	4	July, "	125	130
" " Certf.	700,000	1,000	3½	Nov. "	100	100½
People's "	1,600,000	10	3½	July, "	95	100
" " Certf.	300,000	1,000	3½	July, "	95	97½
" " Bds	325,000	....	3½	Aug. "	100	101
Metropol. "	1,000,000	10	3½	May, "	95	100
Wmsburgh "	1,000,000	50	5	July, "	145	155
" " Certf.	1,000,000	....	3½	July, "	100	101
Citizen's "	1,200,000	20	2½	Oct. "	130	140
" " Certf.	320,000	1,000	3½	Oct. "	100	101
J. C. & Hob'n. N.J.	386,000	20	5	July, "	160	†170
Centl. Westch. N.Y.	466,000	50	4	July.	100	105

† Gold.

Companies out of Town.*	Cap. Stk.	Par	Bid	Askd.
People's " " of J. C.....			130	
Citizen's G. L. Co., Newark, N.J.	1,000,000		60	70
Hempstead" " L. I., N.Y.	40,000	100		100
Jamaica, " " " "	25,000	100		100
Richmond Co., S. I. "	300,000		100	105
Citizens', Rochester, "		100	60	68
Rochester Gas Co., "		100	50	
People's G. L. Co. Albany,"	1,000,000	100	31	40
Mutual " Buffalo "	750,000	100	55	60
Mutual " Detroit. Mich.		50	20¾	24
TroyG. L. Co., Troy, N. Y.....			108	
Brockport, N. Y., G. L. Co.	25,000	100		80
Baltimore G. L. Co., Balt., Md.	2,000,000	100		195
People's G. L. Co., Balt., Md	2,000,000	25	27¼	
Hannibal G. L. Co., Hann., Mo.	100,000	100		60
La Clede, Mo				123
Lewiston G. L. Co., Lewis., Me	400,000	100		75
Chicago G. L. Co., Chicago, Ill.	2,000,000	100	140	
Jacksonville, Ill.....	120,000	100	82	85
Lima, Ohio.....	60,000	100	10	
Derby G. L. Co., Derby, Conn..	160,000	100		80
Woonskt G. L. Co.Woonskt,R.I.	150,000	100	100	
Fort Wayne G. L. Co. F. W.,Ind		100		105
North. LibertiesG. L. Co. Phila.		25	38¼	
Wilkes-Barre G. L. Co W. B. Pa.		50	70	
Washington G. L. Co., Phila....			42	43
Pottsville, Pa., Gas Co....		50	40⅛	
Portland G. L. Co. Portland, Me	350,000	50	72	75
Hartford G. L. Co., Hartford,Ct	700,000	25	45	
Boston G. L. Co., Boston, Mass.	2,500,000	500	772½	777½
Chelsea G. L. Co. Chelsea, "	300,000		139	
Cambridge G. L. Co., Cam., "	700,000		132¾	
Louisville G. L. Co., Louis., Ky.			127	
Cincinnati G. L. Co , Cincin, O..				200
S. F. G.L. Co. San Francisco,Cal	10,000,000	100	94	
City G. L. Co. Montreal, Canada	1,440,000	40	132	135
Consumers G. L. (old.)Tor., Ont	600,000	50	131	
Hamilton G. L. Co.. Ont.....	150,000	40	112½	
Halifax G. L. Co., Halifax, N.S..	400,000	40	149	

* These quotations represent the latest obtainable prices at which sales were made.

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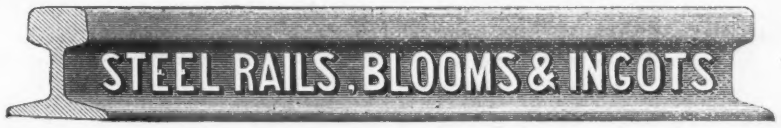

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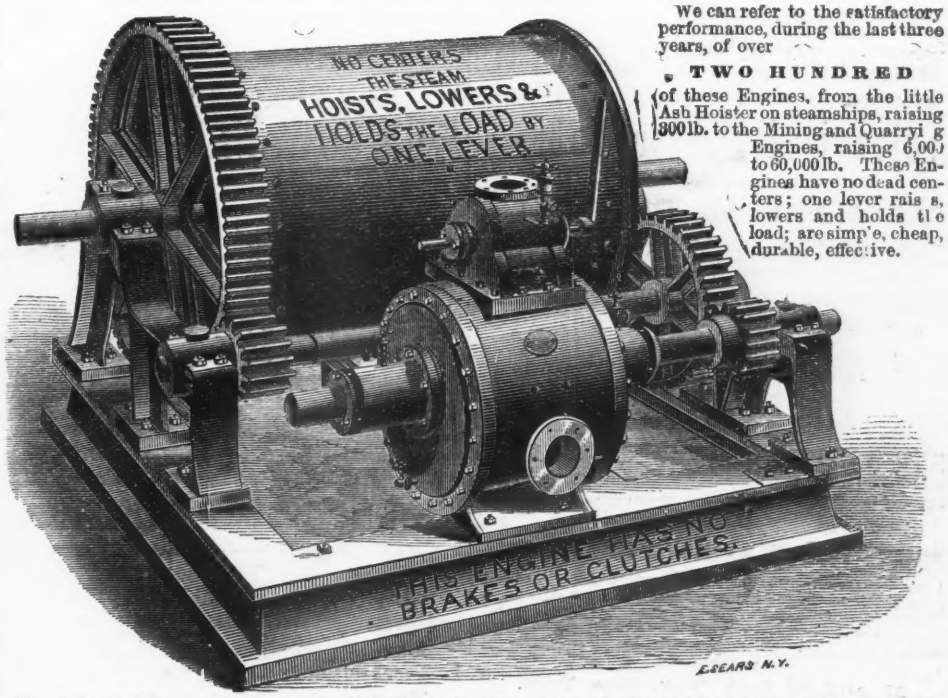

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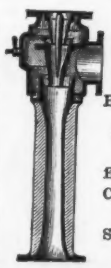

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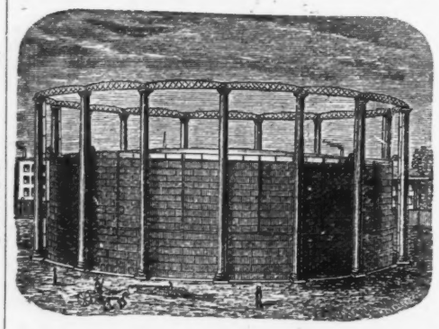

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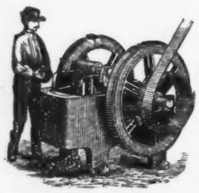

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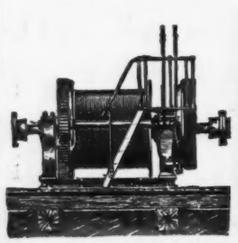

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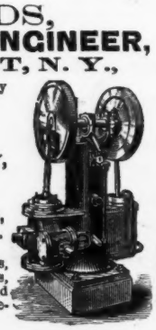

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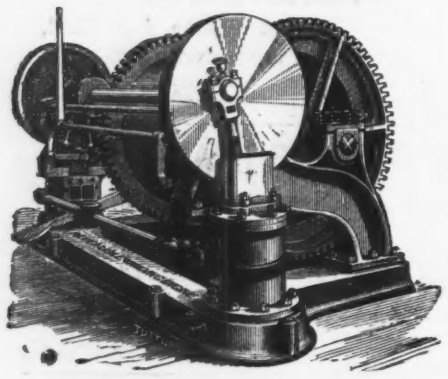

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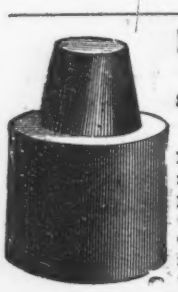

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SALT LAKE CITY, Dec. 1, 1874.

A. S. HALLIDIE.—DEAR SIR: I have pleasure in stating that your Ropeway, put up at the Chicago Mine, Ophir District, Utah Territory, one year ago last summer, has been in constant use ever since, and with the most satisfactory results.

The line, as you are aware, is constructed over an extremely rugged country, one and one quarter miles in length.

For the first half mile or so, it is down a very steep mountain side, whence it passes over the brow of another one; thence it continues down Dry Canyon at an angle of fifteen to eighteen degrees.

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Manager Chicago S. M. Co. (limited.)

Supt. Office EMMA HILL CONSOLIDATED M. CO.
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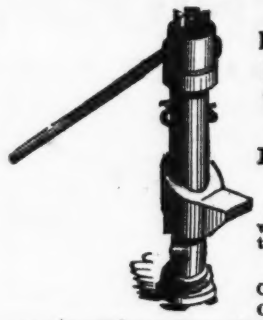

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